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The Iron and Steel Bill and the Foundry Industry

Last Friday the Government published the text of its Iron and Steel Bill, through which it proposes to bring into public ownership the major part of that industry. To carry out this scheme it is proposed to create a new organisation called the Iron and Steel Corporation of Great Britain, which will purchase at Stock Exchange prices all the shares issued by 107 named companies. The vesting date is fixed at May 1, 1950. The concerns to be acquired are those mining iron ore, which produce 50,000 tons a year or more; and pig-iron makers smelting a minimum of 20,000 tons. A like output from a steelworks or rolling mills also qualifies it for extinction as a private concern. Moreover, smaller companies will have to have licences, which may contain conditions concerning period quantities, price and sale. The companies taken over will continue to operate under their existing titles and therefore, to some extent, will retain their individuality.

In theory, the foundry industry is unaffected by the Bill, but in practice it means that a serious output would be lost to private enterprise, for with the acquisition of these 107 companies there is to be included all subsidiary companies and activities. Thus the making of heavy cast-iron pipe would be largely a Government monopoly. There is normally much export of this commodity, and one can envisage all sorts of difficulties in the selling of State monopoly goods abroad. Ingot-mould foundries, with but a few exceptions, will also be removed from private enterprise. At a rough guess, we would estimate that at least 40 ironfoundries would be taken over. There is even a non-ferrous foundry among the subsidiaries.

Regarded from no matter what angle, this Bill is as unnecessary as it is fundamentally bad. The industry is already adequately controlled through the Iron and Steel Board. It has been free from industrial strife throughout our lifetime, as its leaders on both sides have exercised a statesmanlike approach to their problems. It is making a great contribution to the country's economic recovery. These proposals to place it under public ownership could scarcely have been made at a more inappropriate time. Thought that should be given to the production of increased output of enhanced quality will now be distracted, for with the publishing of the Bill there are a number of inhibitions which are virtually in force now, as its provisions are, in many respects, retrospective either to last Friday or even as far back as the day when the Prime Minister announced the intention of the Government to create a State monopoly of iron and steel making. Will, for example, an overseas buyer place a long-term contract with a concern the structure of which may be changed on May 1, 1950? We presume that employment contracts may be of different legal standing if signed before or after last Friday. The Ford Motor Company, Limited, though it is a pig-iron manufacturer, is not to be taken over, because it makes motor vehicles, but the Carron Company is not exempt because, *inter alia*, it makes kitchen utensils. The names of some makers of steel castings are listed as suitable for sacrifice on the altar of Marxian socialism, whilst others are left "free" (their prices may be controlled under their licence) to compete with them. Finally, if a firm under private enterprise grows to the 20,000-ton a year limit, then those who have achieved this success are to be rewarded by expropriation of the State of their property, through forced sale. Surely this Bill is the worst possible example of theoretical socialism run amok.

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The Iron and Steel Institute

Autumn Meeting, 1948

The Autumn Meeting of the Institute will be held on November 10 and 11, under the chairmanship of the President, Sir Andrew McCance, LL.D., D.Sc., F.R.S. The sessions will take place at the offices of the Institute, 4, Grosvenor Gardens, London, S.W.1. Buffet luncheons (price 6s. each per person) will be arranged in the Institute Library between the morning and afternoon sessions on both days.

PROGRAMME

WEDNESDAY, NOVEMBER 10

Morning Session:

10.0 a.m.—Formal business, including statutory notice of a proposal to amend bye-laws, followed by discussions on (1) "A Note on the Varying-turbulence Cowper Stove—the Denain-Anzin Tests and the CS1 Standard Cowper Stove," by D. Petit; (2) "Magnetic Concentration Experiments upon Iron Ores in N. Lincs Practice," by L. Reeve; and (3) "The Work and Organisation of a Statistical Department in Heavy Industry, with particular reference to the Steel Industry," by A. W. Swan.

Afternoon Session:

2.30 p.m.—Discussion on:—(1) "The Aplication of Oxygen-enriched Air to Side-blown Converter Practice," by L. L. Harrison, W. C. Newell and A. Hartley; (2) "Development of an Improved Basic-Bessemer Steel," by H. A. Dickie; and (3) "Ingot Structure in a Series from Rimmed to Killed Steel made from the Same Cast," by P. M. Macnair.

THURSDAY, NOVEMBER 11

Morning Session:

10 a.m.—Discussions on:—(1) Ingot Surface Defects in Structural Steels," by L. Reeve; (2) "Open-hearth Furnace Instrumentation," by E. Rogers; (3) "First Report of the Open-hearth Instruments Sub-committee," by F. L. Robertson; (4) "Rapid Estimation of Slag Basicity," by W. A. Smith, J. Monaghan and W. Hay; and (5) (time permitting) "A Note on the Determination of Moisture in Producer Gas," by J. Pearson and R. Toye.

Afternoon Session:

2.30 p.m.—Discussions on:—(1) "Fatigue Tests on Crankshaft Steels," by P. H. Frith; (2) "A Magnetic Study of the Structure of Cold-worked Iron-nickel-chromium Alloys (Stainless-steel Wires)," by P. T. Hobson, E. S. Chatt and W. P. Osmond; and (3) "The Interrelation of Hardenability and Isothermal Transformation Data," by W. I. Pumphrey and F. W. Jones.

MR. E. W. A. DAY has resigned his position as organiser of Division 205 of the Amalgamated Union of Foundry Workers on having accepted a post as foundry manager.

SIR GEOFFREY HAYWORTH performed the opening ceremony of the Production Engineering Research Association's laboratories at Staveley Lodge, Melton Mowbray, on October 26, the Rt. Hon. Lord Riverdale presiding. Actually, the laboratories have been functioning for about a year, and have already a successful record of service to industry.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

NOVEMBER 6.

Conference on Laboratory Accidents

Organised jointly by The Royal Institute of Chemistry; The Institute of Physics; and the Institution of Metallurgists, at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, 10 a.m. to 12.30 p.m. and 2 to 4.30 p.m.

NOVEMBER 8.

Institution of Production Engineers.

Halifax Section:—Sound film, "The Production of High Quality Steel," at Whiteley's Café, Westgate, Huddersfield, at 7 p.m.

NOVEMBER 9.

Chemical Engineering Group.

"Heat Transfer," by A. D. Davidson, in the apartments of the Geological Society, Burlington House, London, W.1, at 5.30 p.m.

NOVEMBER 10.

Institute of British Foundrymen.

Lancashire Branch:—"Details of Some American Foundry Visits," by Mr. Nield, at 7 p.m., in the Engineers' Club, Albert Square, Manchester.

Birmingham Branch, Students' Section:—"Non-ferrous Metal Castings," by G. M. Callaghan, at the Dudley and Staffordshire Technical College, Dudley, Worcs, at 7.15 p.m.

Institution of Production Engineers.

Birmingham Senior Section:—Afternoon works' visit to B.T.H., Limited, Rugby.

Luton Graduate Section:—"Modern Methods in Sand Casting," by G. A. Smith and E. Daybell, at the Midland Hotel, Luton, at 7.30 p.m.

North-Western Fuel Luncheon Club.

"Starlight and Moonshine," by Professor R. J. Sarjant, O.B.E., D.Sc., at the Engineers' Club, Albert Square, Manchester, at 12 noon for 12.45 p.m.

NOVEMBER 11.

Institute of British Foundrymen.

Lincoln Section:—"An Evening of Light and Colour," by T. E. Hartley, B.Sc., at Lincoln Technical College, at 7.15 p.m.

Institution of Production Engineers.

Cornwall Section:—"Cast Iron as an Engineering Project," by Dr. H. T. Angus, M.Sc.

The Institute of Metals.

London Local Section:—Annual Meeting, followed by "Resources of Strategic Metals," by Professor W. R. Jones, C.B.E., B.Sc., D.I.C., at the Royal School of Mines, South Kensington, London, S.W.7, at 7 p.m.

NOVEMBER 13.

Institute of British Foundrymen.

Scottish Branch:—"The Production of Grey Iron Castings," by C. R. van der Ben and H. Haynes, at the Royal Technical College, Glasgow, at 3 p.m.

Newcastle Branch:—Paper on "Steel Castings," by S. Finch, at the Neville Hall, Newcastle-upon-Tyne, at 6 p.m.

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40 Years Ago

The November, 1908, issue of the FOUNDRY TRADE JOURNAL calls attention to the dangers involved through the use of unsuitable footwear by foundry workers. Use is made of German statistics to show the trends in the direction of immunity from burns. There is an illustrated account of a machine for daubing ladle bowls. Apparently one merely put the requisite quantity of refractory in the bowl and placed it under a fly-press carrying a die to form the interior shape. There are announcements that Alfred Herbert, Limited, of Coventry, received a "Grand Prix" for their machine tools shown at the Franco-British Exhibition, and that Fischer's of Schaffhausen had started up an electric-steel foundry. The death was announced of Mr. H. E. Pridmore, the American moulding machine maker.

A Study of Residual Gases in Cast Iron*

Important Effects of Relatively Small Quantities

By J. E. Hurst, D.Met., M.I.M., and R. V. Riley, Ph.D., B.Sc., A.I.M.

(*Continued from page* 414)

(9) The Effect of Remelting of Iron on its Gas Content

Do the gas characteristics of iron persist on remelting? The results of gas analyses on a wide variety of cast irons over a period of some three years were examined in detail to find, if possible, an answer to this question. The re-melting of a sample from the old furnace bear previously mentioned gave interesting data on this question. In Table VII are given the compositions, including gas contents of the iron before and after remelting in a siliminite lined, 10-lb. capacity laboratory high-frequency furnace.

Definite changes in composition occurred on remelting. The greatest changes in composition were shown

TABLE VII.—*Change in Composition of Iron on Remelting.*

	Original iron. Per cent.	Remelted iron. Per cent.
Total Carbon	3.47	2.78
Graphite	3.40	2.32
Combined Carbon	0.07	0.46
Silicon	3.96	3.99
Sulphur	0.050	0.034
Phosphorus	1.41	1.43
Manganese	1.14	1.09
Nickel	0.01	0.02
Chromium	0.12	0.10
Copper	0.01	0.01
Molybenum	<0.005	<0.005
Vanadium	0.25	0.21
Titanium	0.17	0.15
Aluminium	0.01	0.01
Arsenic	0.040	0.035
Gases—		
Hydrogen	16.0	2.5
Oxygen	190·0	20·0
Nitrogen	20·0	10·0
(Parts per million.)		

by the gases hydrogen, oxygen, and nitrogen. The abnormally high hydrogen and oxygen content of the original metal was reduced to approximately one-tenth during remelting and the nitrogen was lowered by 50 per cent. It is clear, therefore, that in a pig-iron containing a high hydrogen and oxygen content the losses on remelting are considerable, and the changes are of a higher order than the changes in the percentage of common elements like carbon, silicon, sulphur and manganese.

It must not be supposed that the gas content of an iron always falls on remelting; the final value appears to depend upon the initial content and the type of melting unit used. The commercial production of an acid-resisting silicon iron (14 to 16 per cent. Si) in a direct-arc electric furnace afforded the opportunity for an intensive study of this aspect of the problem. The experiments were made on a full production scale using 20-30 cwt. charges. From an initial charge of steel scrap, pig-iron and ferro-silicon, a first-melt ingot was made. This ingot was then remelted with silicon iron return foundry scrap to give metal for making castings. In some cases the iron made at the second stage was again ingotted and a third melt of these ingots plus first-melt ingots, together with more foundry scrap was used for castings. Almost one hundred separate gas determinations were made upon samples taken from first, second or third melts from the electric furnace, and the results proved to be very informative.

A progressive fall in oxygen content occurred as the iron was remelted. The mean, first, second and third melt oxygen figures for the whole of the investigations were 20, 10 and 5 parts per million respectively. The position in respect of hydrogen was not so definite; although, in a number of individual experiments, re-melting secured a substantial reduction in hydrogen, especially when the initial content was high, the average values showed a striking similarity in first, second and third melts. It appeared difficult to remove hydrogen from silicon-iron by remelting when the bath contained less than 2 mls. per 100 gms., or 2 parts per million of hydrogen. In certain melts where the charge was notably low in hydrogen, a small increase occurred on remelting.

Remelting appeared to have very little effect upon the nitrogen percentage of silicon iron except when the initial figure in the first melt was abnormally high (*i.e.*, over 20 parts per million), in which case a reduction to an average value of 5 parts per million resulted.

The relationship between the gas content of an iron and the melting unit was demonstrated once more in experiments which were conducted upon the melting of grey iron in various types of open-hearth type furnaces, fired by pulverised coal and by oil and located at different works. The iron was required for exactly similar castings at all the works, and the metal charged was in certain cases identical, iron having been transferred from one works to the others for the purpose of the experiments. It was found that one of the furnaces yielded iron of somewhat higher oxygen content than the iron from the other furnaces. The difference was recognised as being due to a slightly different design and method of working the charge.

In conclusion, it may be stated with some confidence that the gas content of a cast iron may be changed

*A communication from the Staveley-Bradley & Foster Research Department, presented at the London Conference of the Institute of British Foundrymen.

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during a remelting process. The direction of the change is partly dependent on the melting unit and partly upon the initial gas content of the iron charged. Irons of similar composition on remelting tend towards a stable gas content which appears to depend largely upon the nature of the furnace and operating technique.

(10) The Influence of the Composition of Cast Iron on the Residual Gas Content

Over one hundred separate gas determinations which have been made in the Authors' laboratory on all types of cast iron have been examined in detail to discover whether irons could be classified according to their hydrogen, oxygen or nitrogen contents. The available data indicate that the concept "typical gas content" for a given class of cast iron have some meaning provided the limits chosen are wide and the melting conditions and foundry procedure be standardised. With commercial acid-resisting silicon iron, for example, as cast in the Author's foundry, the typical gas analysis may be given with confidence:—

Hydrogen	1.0 to 2.0 parts per million
Oxygen	10 to 20 " "
Nitrogen	5 to 10 " "

For other classes of cast iron where the data are not so complete more difficulty is found in advancing limits of gas composition.

In a study of British foundry pig-irons' certain differences become apparent between the various classes of iron. Table VIII shows the range in gas contents found with hematite, cold-blast and phosphoric foundry irons.

Hematite irons from all sources showed the widest variations in gas composition and also the highest mean hydrogen and oxygen contents. Cold-blast pig-irons from three manufacturers were very regular in gas composition and showed the lowest mean hydrogen and oxygen contents of all the pig irons tested. Phosphoric foundry irons gave intermediate values for hydrogen and oxygen. From the series of 20 irons giving the results shown above, one checked estimation on an isolated Northamptonshire pig sample gave the abnormal hydrogen and oxygen values of 11.0 and 350 parts per million respectively. To avoid placing undue emphasis on this result it has been omitted from Table VIII.

Cast iron, being a very complicated alloy of iron, it is hardly surprising that the work carried out in the Author's laboratory so far has yielded little information on the effect of individual constituents on the gas content. All the results have been closely scrutinised to see if it were possible to enumerate the effects of carbon, silicon, sulphur, phosphorus or manganese upon the residual hydrogen, oxygen and nitrogen. In most cases, also, the specimens were examined spectrographically for "trace" elements. It has proved impossible at the present state ot knowledge to find a definite correlation between any of these individual constituents and the gas content of the iron.

(11) The Effect of Gas Content on the Micro-structure, Physical and Mechanical Properties of Cast Iron

An interesting comparison between American and British monobloc castings for internal combustion engines tended to show that differences in residual hydrogen might have some effect upon the micro-structure and hardness of the two monobloc cylinder castings.

TABLE IX.—*The Compositions of American and British Cylinder Irons.*

Composition.	American iron. Per cent.	British iron. Per cent.
Total carbon	3.37	3.36
Silicon	2.13	2.08
Sulphur	0.116	0.105
Phosphorus	0.19	0.14
Manganese	0.77	0.89
Nickel	0.11	0.11
Chromium	0.36	0.34
Molybdenum	0.03	0.03
Vanadium	0.03	0.03
Titanium	0.05	0.09
Copper	0.11	0.13
Aluminium	<0.05	<0.05
Gas analysis—		
Hydrogen	7.5 parts per million	3 parts per million
Oxygen	65 "	60 "
Nitrogen	55 "	65 "

The American cylinder was softer and contained more ferrite in its micro-structure than the British cylinder iron (samples taken from identical locations on each cylinder block). Despite these differences the chemical and spectrographic analyses shown in Table IX proved to be almost identical for each iron. Titanium alone showed any substantial difference. The two samples were subjected to a vacuum-fusion gas-analysis and gave the results shown also in Table IX.

If it be assumed that the melting and casting conditions of the two cylinder blocks was the same and that the minor variations in composition may be neglected, it might appear that hydrogen was alone responsible for the differences in micro-structure and hardness. It is interesting to compare the supposition that hydrogen in cast iron tends to give a more ferritic iron, with the

TABLE VIII.—*Range of Gas Content with British Foundry Irons.**

Type of pig iron.	Hydrogen.			Oxygen.			Nitrogen.		
	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.
Hematite	16·0	4.5	9.5	810	30	190	50	10	25
Cold blast	2.5	2.0	2.5	40	20	30	40	20	30
Phosphoric	7.5	2.0	3.5	160	15	45	55	10	35

* All results given in parts per million.

behaviour of the sample of blast furnace "bear" on re-melting in a laboratory high-frequency furnace.

The compositions before and after remelting the furnace "bear" given in Table VII show that the combined carbon increased from 0.07 to 0.46 per cent. on re-melting. The change in micro-structure is shown in Figs. 8 and 9. Apart from a decrease in sulphur percentage from 0.050 to 0.034 per cent., which would certainly not give rise to *more* combined carbon, no major change in the composition of the remelted iron occurred. Only the gas content changed. The most striking change was a ten-fold drop in hydrogen and oxygen on re-melting. Is it possible that high hydrogen content tends to give a ferritic iron, other things being equal?

Whilst it is true that only scanty data are available to suggest that hydrogen prevents the formation of carbides in cast iron, there is also evidence to indicate that in the absence of this gas (*i.e., in vacuo*) an iron will tend to solidify white. This has been demonstrated many times in the Authors' vacuum fusion experiments with high-silicon iron. When the ingot from the graphite crucible was examined under the microscope the iron had invariably a very coarse grain size due to the slow cooling conditions, but it showed a "super-cooled" type of graphite of extreme fineness suggesting that it had been formed from a stabilised solid carbide somewhat late in the cooling-down process. Iron of this type containing 14 to 16 per cent. silicon is hyper-eutectic in respect of carbon under these conditions. Silicon iron of the same type when melted under atmospheric pressure has been shown to have coarser graphite the more hydrogen it contains.

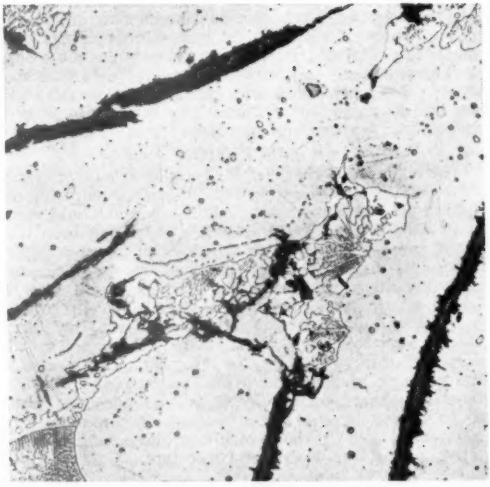

FIG. 8.—MICRO-STRUCTURE OF BLAST-FURNACE "BEAR" AS FOUND. × 600.

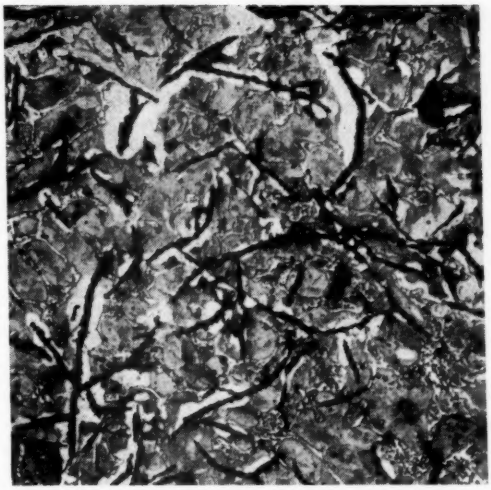

FIG. 9.—MICRO-STRUCTURE OF THE SAME IRON AS FIG. 8 AFTER REMELTING IN HIGH-FREQUENCY FURNACE. × 600.

One theory of inoculation regards hydrogen as the agent responsible for the production of flake graphite in iron. Whilst this theory might appear attractive in the light of several results already quoted, it has not been possible to prove it conclusively. One experiment did in fact tend to disprove the theory. An iron was chosen which would just solidify white in a given sand mould. Upon inoculation of the molten metal with powdered graphite it could be made to solidify grey with only ¼ in. of surface chill. When a previously de-gassed graphite powder was used as the inoculant the result was the same as with the ordinary graphite. The inoculating effect in this case was mainly, if not entirely, due to the graphite, and not to the hydrogen which commercial graphite always contains.

A number of experiments have been conducted in order to assess the importance of gas content to the solution of such problems as the anomalous behaviour of malleable iron on annealing, and mottle spread and chill depth in roll-making irons. No conclusive results have been forthcoming, but the findings were in certain cases sufficiently interesting to call for more attention at a future date.

(12) Gas Content and its Significance in the Production of Sound Castings

Porous castings are probably still the greatest evil to which the foundry is prone. Although a large number of different types of porosity defects are known, most are, right or wrongly, attributable to "gassy metal." Even shrinkage cavities are occasionally passed off in this way, when responsibility then passes from the

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moulder to the metallurgist. Wartime research into the production of acid-resisting silicon-iron castings in the Authors' works has solved most of the problems of gas porosity attaching to this metal. This work has involved many gas estimations with the vacuum-fusion apparatus, and a knowledge of the residual gas content has proved all-important to the proper understanding of the foundry technique.

It was found that in sound castings of silicon iron the residual hydrogen content seldom exceeded 2 mls. per 100 gm. or 2 parts per million. In sound castings the oxygen was also low, a typical value being 0.0010 per cent. or 10 parts per million. Careful choice of raw material was necessary to give a melt of sufficient purity in respect of hydrogen and oxygen. Ferro-silicon was found to be a raw material liable to have a high hydrogen content; 15 parts per million were found in some samples. Rusty steel scrap also could promote a large hydrogen and oxygen pick-up. The hydrogen and oxygen was removable on remelting only with difficulty, and it was important to secure a melt-down low in these gases. If the hydrogen and oxygen were present in amounts greater than the limiting values given above, difficulty was experienced in the production of sound castings.

Hydrogen could enter molten silicon iron not only in the furnace from raw materials, but also from the moisture of incompletely-dried ladles, wet linings and runners, and in some cases even from moulds and cores. Whatever the source of hydrogen it was important that the residual content in the iron should not exceed 2 mls. per 100 gms. (2 parts per million). On the other hand, it was desirable not to attempt to free the iron from all its hydrogen and oxygen (even if this could be accomplished), or otherwise excessive shrinkage on solidification occurred which also caused trouble in the foundry. The optimum hydrogen content of 2 parts per million was important also in the avoidence of a troublesome form of spontaneous cracking which could occur with large castings.

The 2 parts per million limit for hydrogen in castings of high-silicon cast iron appears to be of wider and more general application to the ferrous industry. For example, cast-iron rolls tend to have a uniform limiting hydrogen content of about this figure. Table X shows typical gas analyses of commercial cast-iron roll samples.

TABLE X.—*Typical Gas Analysis of Cast-iron Rolls.*

Hydrogen, parts per million	Oxygen, parts per million	Nitrogen, parts per million
1.5	20	30
2.0	10	40
2.0	10	40
1.5	30	50
1.5	50	30
2.0	35	40
1.5	20	40
2.0	15	35
2.5	20	40
2.0	40	30
2.0	35	35

The limit of 2 parts per million for hydrogen also appears to hold with steel. In a recent Paper to the Iron and Steel Institute, Sykes, Burton and Gegg[8] recognised this limit of hydrogen to be consistent with good ductility in steel.

It is not to be inferred that hydrogen alone is the only important element in the avoidance of blowholes and porosity troubles in iron. Oxygen appears to be subtly connected with some of the occurrences of unsoundness which have been investigated. In all the work on gases in cast iron a loose relationship between hydrogen and oxygen has been noted which is almost certainly not merely coincidental. It was not possible to detect a regular variation with type of iron or even an established ratio of hydrogen to oxygen, but the tendency for these gaseous impurities to progress in step cannot be overlooked. It is perhaps not to be expected that a fixed ratio of hydrogen to oxygen would be found, as it is not known at present how much of the recorded oxygen is due to carbon monoxide evolved in gaseous form from the metal and how much is due to the reduction of oxide or other inclusions present in the iron. The ratio of hydrogen to oxygen in a given iron is possibly more important than either element alone in governing the properties of the iron. In passing, it may be stated that in two investigations on cast-iron mono-bloc cylinders an oxygen content of 30 parts per million appeared to give more desirable all-round properties than a lower value of 10 parts per million, the hydrogen in each case being around 2.5 parts per million.

In contrast to the other two gases, the occurrence of nitrogen in iron is confined within fairly narrow limits, ranging from 10 to 60 parts per million. This fact is of some interest when it is considered that quite large variations in nitrogen content have been recorded with steels, *i.e.*, 20 parts per million in a boiler-plate steel to 190 parts per million in a rimming basic Bessemer steel.[9] No correlation has been found between the residual nitrogen content and any of the foundry or mechanical properties of cast iron.

DISCUSSION

The Chairman (Mr. R. B. Templeton), commenting on the Paper before opening the discussion, said the subject of gases in metals had, the Authors said, been dealt with in over 1,000 articles. There had been infinitely more discussions on the possible practical influences of dissolved gases on foundry practice, and probably no subject had been discussed with so little basic information. The data now given in such a lucid way laid a very secure foundation for future work. Probably the most controversial subject in cast iron metallurgy was that of inherent properties, and the question of dissolved gases was inevitably brought into such discussions. With the infinite care given to their tests by the Authors, it was not too much to hope that with further work the subject might soon move out of the realm of conjecture.

Sulphur Di-oxide

MR. J. L. FRANCIS, opening the discussion, said it was entirely fortuitous that he found himself there opening the discussion.

One of the gases which was not mentioned at all in the Paper was sulphur di-oxide, and he would have thought sulphur di-oxide would be present in cast iron because one could often smell it coming from the molten metal when it was tapped into the ladle.

Also, with respect to hydrogen increasing or tending to increase the ferritic content in the metal structure, perhaps he was wrong about it, but he had always understood that when there was more moisture in the air blast blown in to the cupola the iron tended to chill more easily and shrink to a greater extent. That seemed to be borne out, particularly in the production of single-cast piston rings, where some firms went to the trouble and expense of dessicating the air, not to complete dryness, but to a controlled moisture content, because of the tendency of uncontrolled moisture, particularly in the upper limits, to cause chill and shrinkage.

There was one other thing in connection with the failure to detect any hydrocarbon gas, except in trace amounts. He remembered that when iron had been inoculated with calcium silicide there was a definite smell of hydrocarbon gas when the material was freshly fractured. Of course, it might be that an extremely small quantity of gas might be detected by smell, but then, they were dealing with very small quantities of gas.

DR. RILEY, dealing with the points raised, said they had not detected any sulphur di-oxide, but could readily agree that a smell of sulphur di-oxide was often apparent in the foundry. Regarding the influence of hydrogen on the metallographic structure, it was a very difficult matter to resolve because of the manner in which hydrogen and oxygen often progressed step by step with each other. It was very seldom that one could find a casting rich in hydrogen without it also being rich in oxygen, and the combined influence of the two gases might have a different effect on the microstructure from the one mentioned in the Paper. As to inoculation giving rise to the smell of hydrocarbon gas, he thought, probably, the amount of the noxious hydrocarbon gas was too small to be detected by the apparatus which had been used in that work.

Analogy with Non-ferrous Practice

MR. FRANK HUDSON said he had often suggested that before a man can call himself a good foundryman he should possess that knowledge which will enable him to produce both ferrous and non-ferrous castings with equal skill. He proposed, therefore, to introduce into this discussion one point connected with gases in non-ferrous metals which he thought might have a bearing in the grey-iron field.

In recent work done by the British Non-ferrous Metals Research Association it had been found that gas might be quite easily absorbed by the metal from moisture in sand moulds, etc. The effect was observed in phosphor-bronzes and the amount of gas absorbed and the resultant degree of gas unsoundness increased with the phosphorus content of the melt. For example, alloys containing 10 per cent. tin and up to 0.3 per cent. phosphorus absorbed very little gas when poured at temperatures up to 1,130 deg. C., while with higher phosphorus contents and for higher pouring temperatures considerable absorption occurred. Drying the sand mould at 200 deg. C. did not prevent the gas absorption, but drying at temperatures sufficiently high to dehydrate the clay bond (*e.g.*, 800 to 900 deg. C.) eliminated the effect. Samples of gas extracted from the castings were found to consist mainly of hydrogen, and it was believed that the presence of phosphorus in the metal promoted dissociation of water vapour at the metal/mould interface and the nascent hydrogen formed, diffused into the metal. Maybe, a similar state of affairs occurred in cast iron and this might partially explain why it was more difficult to make pressure-tight castings in grey iron when the phosphorus content exceeded 0.3 per cent. He suggested that there might be an important relation between hydrogen and phosphorus in grey iron which might well receive further investigation.

DR. RILEY, replying, said they were very glad to notice that in the non-ferrous world similar troubles with gas were being investigated, and also that the influence of moisture in the mould was important. They also had found this to be the case in some aspects of their work, and very high drying temperatures had been required to avoid the grosser forms of gas porosity in some difficult castings of high-silicon iron.

It was very interesting to hear of the influence of phosphorus in bronze and its effect of causing a greater absorption of hydrogen. Unfortunately, the results in their Paper did not appear to fit in with that view. In Table VIII, in which were summarised the gas contents for hematite, cold blast and phosphoric irons, they would see that the highest hydrogen content was in the hematite iron, which had the lowest phosphorus content. That, however, might be due to a different effect, but he thought it was of interest.

Commercial Gas Analysis for Pig-iron

MR. H. G. HALL said he spoke as a member of the joint I.B.F./B.C.I.R.A. Committee on Gas in Cast Iron. The present Paper was of work done mainly, he believed, prior to the Committee being formed, and it was extraordinarily useful as indicating trends and the special differences present in various native pig-irons.

Further, in the Committee it was rapidly established that there was considerable difficulty in correlating results on the same sample from various investigators. Those differences were mainly of technique and had now been overcome. They could now look forward to finding out the effect of various gas contents on the fundamental properties, perhaps hitherto referred to as inherent properties.

A reference had been made in the Edward Williams Lecture that morning to the effect of hydrogen on graphitisation rate and nodules, particularly in black-heart malleable cast iron. He thought they would agree from a study of the present Paper that there were considerable differences, particularly in hydrogen content, in the various hematite pig-irons which were

Residual Gases in Cast Iron—Discussion

available to the industry. It was his hope that they might establish in the Committee, with the help of Dr. Hurst and Dr. Riley, that there were serious differences to be found in re-melting irons, with all those various hydrogen contents, and that they might ultimately persuade the pig-iron makers to take gas analysis as some sort of a check. In fact, he would go further, and say it was a pity that the opportunity now available of obtaining data on the residual elements and gas contents of pig-iron produced from such a wide variety of ores (due to the use, in the present shortage, of so many sources of supply) should be wasted. It seemed to him an excellent opportunity.

DR. RILEY said they agreed with almost everything that had been said. There was a considerable amount of work to be done on the question of gas in cast iron, and even the one aspect that Mr. Hall had mentioned, that of the hydrogen, oxygen and nitrogen content of the chief British pig-irons, this was by no means completely investigated, and considerable work still remained to be done. One specimen sometimes behaved quite differently from another, and it was only by a multiplicity of experimental results that he thought they could establish finality in that matter.

Anomalies

MR. H. J. YOUNG (member) said this Paper dealt with matters so minute as to invite contempt, yet so vital as to render it likely that they account for much metallurgists were unable to explain about grey cast iron. He mentioned two or three of these "inexplicables." First, a mixture of 50 per cent. pig-iron with 50 per cent. scrap iron, both of the same composition, gave a cast iron in some respect or other slightly different from that given if the mixture were altered to a 60:40, 70:30, 40:60, or 30:70 ratio. Further, a mixture of 50:50 pig and scrap iron of 6 in. thickness gave a different result from the same mixture using the same pig and same scrap iron, only the latter being ¼ in. thickness. Again, the iron towards the bottom of a large cylinder-liner casting has a different graphitic structure, tensile and transverse strength and Brinell hardness from that towards the top of the same casting. Again, individually-cast piston rings might chill for reasons totally unconnected with aqueous vapour in the cupola blast. Finally, thirty and more years ago foundrymen added ferro-silicon or aluminium at the cupola spout and called it de-oxidising, "killing," even de-gasifying. A most interesting happening at that time was that a certain air-furnace cast iron containing 2.75 per cent. total carbon and 2.0 per cent. graphitic carbon gave a graphite photomicrograph indistinguishable from that given by a cupola-melted iron containing 3.25 per cent. T.C. and 2.5 per cent. G.C., which phenomenon always appeared to be gaseous in origin if not in result, and to arise from the air-furnace melting. The Authors' Paper was strikingly modest in style and claims alike, but merited the deepest attention. He hoped they might be able to carry on their research into this unspectacular matter, as without doubt it would become a classic if they did.

DR. HURST, replying, said Mr. Young was old enough to remember the discussions that had taken place in those meetings years ago on the presence of gases in cast iron. It had always been a matter of speculation as to whether they were there or not. The only way they could find out was to get them out first and see what they were and what they could do. That was what they were concerned with doing and those were the results reported in the Paper. They had not attempted, as Dr. Riley had pointed out, to theorise on the subject as yet, because it seemed to them more important that they should have many more results before they could really form any precise view as to the distribution of gas in cast iron. Even the question of oxygen content and oxides of carbon had not yet been precisely settled as far as they were concerned, and that matter was having their attention.

That brought him to the fact that there was the joint B.C.I.R.A. and I.B.F. Committee which was considering that subject, and with which his laboratory was participating. It was hoped as the work proceeded they might be able to throw some light on those problems mentioned by Mr. Young.

MR. YOUNG remarked that with regard to the inherent properties of cast iron, after hearing the lecture that afternoon by Mr. Morrogh and Mr. Grant, he thought they could suggest that the inherent properties were really due to metals that had not been detected in the past, particularly when they heard that such minute percentages as 0.02 of cerium had such an important effect on the metal.

The "Synthetic" Approach

MR. FLEMING was extremely interested in the results that had been presented to them. So far the evidence was based on the analytical approach. Could they not get somewhere more quickly by attempting a synthetic approach? Could they alter the matter fundamentally by attempting to alter a cast iron with known qualities with one or other of the gases which they had detected?

DR. HURST, replying, explained that it was obvious from a research point of view that there were two ways of approaching the problem—the analytical one and the synthetic one. At the moment they were concerning themselves with the analytical one. They had felt a desire to find out what gases were in cast iron. The synthetic approach would be largely dictated by a desire to find out something about the actual influence of those gases on the metallurgical characteristics and the properties of the cast iron. Probably either by themselves, or by other people, that method would be adopted in exploring the subject. So far they still found they had much to do in continuing the study of the actual gas in cast iron.

REFERENCES.

7 Full details of an Investigation into the Gas Content of British Foundry Irons, contained in a paper submitted to the Iron and Steel Institute, January, 1948, by the Authors.

8 C. Sykes, F.R.S., H. H. Burton, and C. C. Gegg, "Hydrogen in Steel Manufacture," *Journ. Iron and Steel Institute*, 1947, part II.

9 Third Report of the Oxygen Sub-Committee, Iron and Steel Institute.

The British Cast Iron Research Association*

Twenty-Seventh Annual Report of the Council for the Year, 1947-48

New Membership Basis

The close of the year 1947-48 brought about the most momentous change hitherto recorded in the history of the Association. Since its inception it has depended for its industrial support on voluntary membership by individual firms, who contributed in accordance with size, and although the actual subscription basis has been modified from time to time, its essentially voluntary character has not altered. The annual industrial income has been increased from £2,500 in 1921 to over £29,000 in 1947-48 and the number of member firms has increased from under 200 to 523. Nevertheless, for many years the Council have borne in mind the desirability of spreading the responsibility for subscriptions over the entire industry, which during the war comprised some 1,800 producing ironfoundries, and now comprises about 2,000. Since the whole industry benefits indirectly from the activities of the Association, it is equitable that all should contribute, and in no other way is it possible to contemplate the income of £100,000 per annum which, in the view of the Council, is necessary to meet all the demands the industry is likely to make in future.

The Council therefore welcomed the proposals of the Joint Iron Council to broaden the basis of membership. During the war, the various trade associations concerned with the manufacture of foundry pig-iron, the ironfounding industry's primary raw material, joined together to form the Council of Iron Producers, while the various trade associations, concerned with the ironfounding industry and working either on a specialised product basis or on a regional basis, came together to form the Council of Ironfoundry Associations. These two bodies then constituted the Joint Iron Council.

As a result of an arrangement made by the Joint Iron Council, with the approval of the Iron and Steel Board, a substantial proportion of the Association's future income will come from a levy on foundry pig-iron. For the year 1948-49 the total income from foundry pig-iron sources will be £45,000.

In view of this change, which occurs at the close of the third year of a normal five-year grant period, the Council approached the Advisory Council to the Department of Scientific and Industrial Research for a revision of the grant terms. After consideration of the case put forward by the B.C.I.R.A. Council, the D.S.I.R. Advisory Council offered, and the Association accepted, a five-year grant arrangement, to date from July 1, 1948, based on a block grant of £20,000 for an industrial income of £45,000, together with a supplementary grant of £1 for £1 up to £20,000 for a further £20,000 of industrial income. The £65,000, which may be regarded as guaranteed for 1948-49 represents an increase on the Association's current income, but the great problem of the Council is to forecast how much additional grant-earning income can be obtained. Clearly, if this could be built up to £20,000, the total income would consist of the initial £65,000 plus £20,000 additional grant-earning income, plus £20,000 supplementary grant, or £105,000 in all, thus reaching the Council's target figure.

In order to take fullest advantage of this offer, members have been invited at their discretion to make small voluntary contributions, since the proceeds of the levy and the grant thereon will leave a gap to be bridged if the Association is to meet all the responsibilities the industry will desire to place upon it. This change will, of course, mean that every ironfoundry in the U.K. will be entitled to apply for membership of the Association, which therefore has to prepare to be fully representative of the industry.

There will also be a very much closer degree of working between the Association and the Joint Iron Council on matters of general policy, as a consequence of the new financial arrangements, but the autonomy of the Association is in no way affected and it remains under the government of the Council elected by members.

The changes referred to above have now been communicated to all grades of members of the Association and, as far as has been possible from available records, to all producing ironfoundries in the United Kingdom.

Council and Committees

The Annual General Meeting was held in London on December 10, 1947. Dr. Harold Hartley, deputy-chairman of Radiation, Limited, and President of the Institution of Gas Engineers, was re-elected President. The Council re-elected Mr. P. H. Wilson, O.B.E., as chairman and Mr. G. T. Lunt as honorary treasurer. Five meetings of the Council were held during the year and the Executive Committee met on eight occasions. Eight meetings of the three main committees took place, Mr. J. J. Sheehan being chairman of the Research Committee and the Development Committee, and Mr. T. M. Herbert, chairman of the Information and Publications Committee. Fourteen meetings of sub-committees and panels were held, in addition to meetings of joint committees. Members' Day was held on July 9, 1947, and was highly successful, some 200 members visiting the Association's headquarters. On account of the membership change this gathering was not held during 1948.

During April 14 to 17, 1948, the first post-war Refresher Course was held at Ashorne Hill, near Leamington Spa, by courtesy of the British Iron and Steel Federation, and a number of talks were given by the staff and external lecturers to representatives of over 200 members. It was unfortunately not practicable to accommodate all who wished to attend. The future of such courses is engaging the attention of the Council, and it is thought that two short courses each year, on

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specific subjects covering a field likely to attract not more than about 150 people, with an occasional more general course of the kind held in April, 1948, will most satisfactorily meet the requirements of members, bearing in mind the limitations of available accommodation.

The Council profoundly regret to record the deaths during the year of Mr. F. J. Cook, M.I.Mech.E., one of the original signatories of the Articles of Association; Mr. H. H. Berresford, Vice-President; and Mr. T. Tyrie, Superintendent of the Scottish Laboratory.

The various sections of the Association are reviewed departmentally below.

Research Department

Research work has continued in accordance with a programme approved by the Research Committee and its appropriate sub-committees, combining both long-term fundamental work and relatively short-term investigations. Fundamental work upon the mechanism of graphite formation has been continued, with particular emphasis upon the production of cast irons yielding nodular graphite structures in the as-cast state without the necessity for applying a heat-treatment. As was foreshadowed in last year's Report, a process has been developed for the production of these structures, and during the course of the year Papers have been presented to various leading technical and scientific societies describing this discovery and giving the properties of the new material. A bibliography of Papers published to date is given in the "Bulletin" for July, 1948. Work has also been carried out on various alternative processes to achieve the same end. On the general subject of graphite formation during the solidification process, an investigation has been made of the effect of small amounts of sulphur in pure iron-carbon alloys. A Paper has been presented to the Iron and Steel Institute giving the results of an investigation upon the carbides occurring in iron-carbon-silicon alloys and in cast irons.

As a basis upon which a more fundamental study can be made of phosphoric cast irons, an investigation has been carried out to study solidification in the ternary iron-carbon-phosphorus system.

The mechanism of graphite formation during the malleable iron process has also been studied and particular attention has been paid to the factors affecting rate of graphitisation and nodule number.

The work on gaseous decarburisation has now reached a stage of completion. In this connection, two Papers have been published in the "Journal" of the Iron and Steel Institute, one dealing with the formation of peel in malleable cast iron, and one with the annealing of cast iron in hydrogen.

A new investigation has been begun upon slag/metal reactions. This subject is almost a virgin field as far as cast iron is concerned, and preliminary work will deal with the electrical properties of slags and the effect upon microstructure of melting metal under slags of various compositions.

Work upon graphitising ladle-additions continues, with the testing of various proprietary products and with the development of new materials for this purpose.

Laboratory Work

The work of the metallurgical section of the Research Department requires the investigation of new methods for the estimation of small amounts of the rarer elements in cast iron. Several reports have been issued on this subject and a comprehensive book on the chemical analysis of cast iron has gone to press, although some time must elapse before it appears. The investigation of the application of spectrochemical methods for the analysis of cast iron has been further developed and a comprehensive report upon this subject appeared in April, 1948. Work is being carried out upon the problem of shrinkage and porosity in grey cast iron. In addition, bearing in mind the needs of the light castings industry, work is continuing upon the fluidity of cast iron.

Experimental work upon sands has been active in connection with the formation of scabs, rust-spotting on light castings, synthetic resins as core binders, and the use of pitch powder. Reports dealing with various aspects of this work were given in the "Journal of Research and Development," June, 1948. An extensive investigation upon the corrosion of cast iron is in progress and during the year particular attention has been paid to the cavitation of cast-iron propellers. This investigation is being conducted in conjunction with the British Shipbuilding Research Association. Various corrosion problems arising in the course of the work of the Development Department have been investigated.

An extensive programme of work concerns the special mechanical properties of cast iron. Various exploratory investigations have been carried out on the fatigue and damping properties of the new nodular cast irons, and their stress-strain characteristics have been determined for tension, transverse, compression and torsion testing. Stress-strain curves have also been determined for ingot mould materials at elevated temperatures. The mechanical properties of ring sections have been compared with those of corresponding round test-bars. The mechanical properties of cast iron at sub-zero temperatures have also been studied. The nature of internal stresses in iron castings is being investigated, in the first instance, by a study of the mechanism and rate of relaxation of artificially applied stresses at elevated temperatures. The influence of section size and shape on the transverse properties of cast-iron beams has been studied and work has continued upon the interpretation of the characteristic stress-strain curves of cast iron.

The effect of gases in cast iron is included in the programme, and work continues upon the various factors which influence gas content and on the determination of gases in cast iron. This work has involved the construction and perfection of new apparatus and the investigation of chemical methods for the determination of nitrogen. Following the development of suitable apparatus, the influence of composition, microstructure and design on resistance to thermal shock has been studied. Apparatus for the determination of thermal conductivity of cast iron has been constructed for use in this investigation and preliminary determinations have been carried out. During the year facilities for testing have been increased by the acquisition of various new

items of equipment, some of which have been purchased and some constructed by the research staff.

The research work of the Association is in the charge of Mr. H. Morrogh, Research Manager. Details of the chemical research programme, including corrosion, gas determination, and spectrography have been supervised by Mr. W. Westwood, and the details of the work on sands by Mr. W. B. Parkes.

Development Department

The number of inquiries dealt with by the Department, including the Scottish Laboratory, totalled 1,195 during the year under review. Major problems amounted to 679, the remainder being treated on a basis of laboratory tests. The staff of the Department have continued to visit members' works in connection with specific problems whenever necessary, and 240 visits, involving 144 members, have been paid. During the year 46 visits have been made to the Association by representatives of member-firms to discuss problems arising in their works.

In addition to dealing with members' problems, a number of investigations appropriate to the work of the Department have been pursued. Work on the relationship between the carbon equivalent value and the strength of unalloyed grey cast iron, originally reported in the "Bulletin" for November, 1946, has been continued with the valuable co-operation of several member-firms, and it is hoped to issue a further report on the subject in the near future. Work is also proceeding for the Shrinkage Panel of the Engineering Castings Sub-committee and the Welding Panel of the Development Committee.

The programme of investigations has also included work on specific problems common to the industry, and several small-scale experiments in producing material and castings for trial in members' works have been carried out. Present shortages of raw materials and the question of possible substitutes are under constant consideration, especially in connection with bonding materials for moulds and cores, a report on which appeared in the "Journal of Research and Development" for June, 1948. The Department is also following closely the variations occurring in the quality of cupola coke. Mr. W. J. Driscoll represents the Association on a Panel of the British Coke Research Association which has been formed to consider the desirable properties of cupola coke. The number of balanced blast cupolas installed is now 343, with an aggregate hourly capacity of 2,640 tons.

The work of the Department is in the charge of Dr. H. T. Angus as manager and Mr. W. B. Parkes as assistant manager. The staff of the Department continue to participate actively in the work of committees of various technical and scientific organisations and research bodies. The Association is also represented on a Ministry of Labour and National Service (Factory Department) Sub-committee of the Joint Standing Committee on Conditions in Ironfoundries.

Scottish Laboratory

As indicated above, the Scottish Laboratory suffered a considerable loss by the death of Mr. T. Tyrie, following a lengthy illness. Steps are being taken to fill the vacancy. In 1949 the lease of the Association's premises at Falkirk will expire and the Scottish Committee has approved the transfer of the laboratory to the Glasgow area, and negotiations are in progress for a suitable site. In spite of the difficult circumstances, the Scottish Laboratory maintained its work during the year and a frequent interchange of visits has taken place between the staff of the Scottish Laboratory and the staff at headquarters.

Intelligence Department and Library

Publication of the "Journal of Research and Development" and the "Bulletin" has been regularly maintained, and 16 Research Reports were published in the former journal during the year under review, prepared by twelve members of the staff. An index to Volume 8 of the "Bulletin" is now in the press. Thirteen External Reports, consisting of Papers of more general interest, several of which refer to nodular cast irons, have been made available to all members. Nine of these reports were Papers prepared by eight members of the staff and given to leading metallurgical institutions. The impending changes in the manner in which the Association's income is derived will almost certainly lead to a very much increased circulation of the "Bulletin" and the "Journal of Research and Development."

Nearly 100 translations of Papers in French, German, Russian and other languages have been made available to members during the year. The high number is due to the fact that most of these are translations of German Papers published during the war years. Several German technical journals have now been revived and are received and abstracted in the library.

The Librarian, Mr. W. Ashworth, took up another appointment at the end of March, 1948, and his successor is Miss D. Drake, who was formerly in charge of the technical library and information services of the Telecommunications Research Establishment at Malvern. The Department is in charge of Mr. G. R. Woodward as manager.

Statistics referring to library are given below:—

Library loans: Books, 362; periodicals, 1,255, and pamphlets, 405. Library accessions: Books, 146; periodicals, 20, and pamphlets, 499. The accessions figure given for the periodicals refers only to new journals or those newly received in the library. The number of inquiries dealt with directly by the Department was upwards of 300, but, in addition, many of the inquiries received in other departments are at some stage referred to the Intelligence Department.

The number of notices appearing in the technical and daily press referring to the Association's work totalled 250 for the year under review.

Building-uses Department

The number of enquiries regarding specific problems has been rather fewer than in the previous year. On the other hand, the requests for general information on the uses of cast iron in building have increased considerably. Many of these requests have come from research students and authors of technical articles, or

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books dealing with materials and equipment in building. In this connection, the Association's collection of photographs and lantern slides, which has been further enlarged, has been of great assistance.

The Department has been represented on B.S.I. Committees and has retained close contact with various associations and societies dealing particularly with heating and cooking appliances. It has been noticeable that these bodies now pass on quite a number of their enquiries to the Association, and the Council of Industrial Design enlisted the help of the Department in the production of a special pamphlet and exhibit for the Building Exhibition at Olympia.

The consultant to the Department, Mr. D. L. Bridgwater, is in charge of the British Ironfounders' Association's exhibition stand at the Building Centre, London, where the photographs of appliances and equipment and samples of finishes are changed at intervals. He has given lectures on the use of the material in architecture to the South-Eastern Society of Architects, the special study course for industrial designers organised by the Council of Industrial Design, the L.C.C. School of Building, the National Foundry College, and the B.C.I.R.A. Refresher Course. He has also been called on to advise the Building Materials Departments of three Schools of Architecture.

Relations with Other Bodies

Contact is maintained in various ways with a large number of technical and scientific organisations and research bodies. In June, 1948, the Director was awarded the E. J. Fox Gold Medal by the Institute of British Foundrymen.

The Director acts as Honorary Adviser and Honorary Treasurer to the National Foundry College, and the first session after re-opening was completed in August, 1948, the next session of the college opened on September 27, 1948. The requirements for the Diploma Course remain substantially the same, but as experience has shown that some candidates lack sufficient technical training, a preliminary course will begin in January, 1949, known as the Diploma Course, Part 1, and lasting six months. In future years, Parts 1 and 2 will be concurrent so that the student who completes Part 1 and wishes to proceed as soon as possible to Part 2 will have an interval of six months during which he can acquire further foundry experience. Candidates who are qualified by training and experience to register immediately for Part 2 of the course may do so without the necessity of undergoing the instruction provided in Part 1.

Finance and Membership

The number of Ordinary and Trade members at June 30, 1948, was 523. For the first time the total income of the Association exceeded £50,000. The whole of the grant offered by the Department of Scientific and Industrial Research was earned. In anticipation of future expansion, £5,000 has been expended on, or reserved for, plant and equipment. It is also hoped to obtain a building licence for a new mechanical testing laboratory and machine shop, which will to some extent relieve existing congestion, as a preliminary to extensions to accommodate staff expansion during the next few years. The progress of the Association is illustrated in Tables I and II. Table I shows the progress from its beginnings to the end of the year under review, the figures of income being expressed as averages over each grant period. (For various reasons the grant periods have not always been five-year periods). Table II shows the actual income for the period July 1, 1945, to July 1, 1948, together with the possible income obtainable during the new five-year grant period starting on the latter date, assuming steady progress during the period. These figures, which of course are estimated, are given in italics.

TABLE I.—*Average Annual Income and Grant*, 1921-48.

Grant period ending June 30.	Industrial income.	Grant.	Other income.	Total.
	£	£	£	£
1921-26 (5 years) ..	2,689	2,685	340	5,714
1926-31 (5 years) ..	4,597	4,556	48	9,201
1931-34 (3 years) ..	6,889	3,000	66	9,955
1934-39 (5 years) ..	8,198	6,150	2,539	16,887
1939-45 (6 years) ..	11,627	7,625	6,521	25,773
1945-48 (3 years) ..	24,966	15,033	4,726	44,725

TABLE II.—*Actual Income and Grant*, 1946-48, *and Estimated Income and Grant*, 1949-53.

Year ending June 30.	Industrial income.	Grant.	Other income.	Total.
	£	£	£	£
1946	21,881	12,900	6,188	40,969
1947	23,238	14,200	3,044	40,482
1948	29,778	18,000	4,947	52,725
1949	*50,000*	*25,000*	*3,000*	*78,000*
1950	*53,750*	*28,750*	*3,000*	*85,500*
1951	*57,500*	*32,500*	*3,000*	*93,000*
1952	*61,250*	*36,250*	*3,000*	*100,500*
1953	*65,000*	*40,000*	*3,000*	*108,000*

Conclusion

The Council is conscious that the year just closed is a milestone in the Association's history and that the changes mentioned above indicate the need of a new Council to reflect the wider representation, and to assume responsibility for the Association's affairs. The task of making the industry research-conscious has been a hard one, but the future is promising. While it is not desirable to prophesy, it is possible that the major technical and metallurgical problems which make control of the product so difficult, are likely to be cleared up within the next five years and thus enable a precision in the control of quality which would have seemed impossible a few years ago. The Council desires to express its sincere thanks to those who have supported the Association in the past and an earnest hope that new members will participate actively in the Association's work, which is essentially co-operative. It is through such co-operation that the Association derives its strength and ultimately its authority.

The Report, which has been slightly abridged, is signed by Dr. Harold Hartley, President; Mr. Percy H. Wilson, Chairman of Council; and Mr. J. G. Pearce, Director and Secretary.

Core-bonding Conference

About 170 delegates attended a conference on core-bonding agents organised by the British Iron and Steel Research Association on Thursday and Friday, October 21 and 22, at Ashorne Hill, near Leamington. Of this number, about 90 were representing foundry interests and about 60 those of the suppliers of core-bonding materials. The conference was ably directed by Dr. W. J. Rees, O.B.E.,* in the chair, and the Papers presented fell into three groups.

Properties of Core-making Materials

The first group, which were considered on the Thursday evening, were devoted to studies of "the potentialities" of various materials for use as core-binders and details of the nature of the bonds produced. In this category were Papers by Prof. T. P. Hilditch (Liverpool University) on the natural drying oils; by Mr. E. B. Harvey (Ministry of Food) on the supply position; Mr. J. M. J. Estevez (I.C.I.) on plastic materials, and Dr. H. K. Whalley (Manchester Oil Refineries) on petroleum derivatives. The chief points developed by the speakers were as follow:—(1) Because linseed oil was in short supply, other cereal binders and natural oils—such as tung oil and even castor oil—could be used; (2) that, while in theory the curing of oils and other bonding materials could be explained in terms of chemical formulæ, these did not express, in any linear function, the behaviour of the adhesion of the various materials in contact with sand; (3) that the plastic groups of urea-formaldehyde and phenol-formaldehyde could be substituted on a 100 per cent. basis for linseed oil (though the use of urea groups was confined to low-melting-point metals); and (4) that petroleum derivatives could replace up to 30 or 40 per cent. of linseed. The discussion which followed this section showed the practical men to be somewhat sceptical of the newer materials on various grounds and rather out of sympathy with the theoretical approach. They felt the best all-round properties were still to be given by linseed oil, and that no adequate substitute had yet been offered. Despite the low price of urea plastics, of phenolic plastics at fifty-seven pounds more per ton and of petroleum aromatic extracts at about one-ninth that of the present price of linseed oil, it was abundantly clear that they held price to be secondary to good core-making and freedom from fumes in baking and on casting-up. Several speakers emphasised that what they desired was a return to normal supply conditions for linseed oil at a price more in keeping with its pre-war level.

Practical Experiments in Foundries

The Papers presented on the following day (Friday) had a more practical aspect. Those in the morning, by Mr. W. M. Lord (Sandholme Iron Company, Limited) on gases evolved and on core-bonding practice abroad; by Mr. H. E. Crivan (Clyde Alloy Steel Company, Limited) on steel-foundry experiments; by Mr. E. C. Dickinson (Morris Motors, Limited) on iron-foundry practice, and an excellently presented report by Mr. G. L. Harbach (Worthington Simpson, Limited) on core-binder experiments in the non-ferrous field, showed that the newer materials were being tried out in the respective spheres. Their attendant economics, advantages and disadvantages were reviewed. In the discussion on the morning's Papers it was agreed that some of the experimental work was promising, but that the bad smell which resulted from the use of plastic derivatives at present almost ruled out these groups, save in cases where fumes could be drawn off at the source.

Core-drying and Core-blowing

The final session of the conference, on Friday afternoon, applied to the actual making and baking of cores rather than strictly to core-binders. An excellent demonstration on a model machine was afforded by Mr. C. E. Tibbs (Radio Heaters, Limited) of di-electric loss core drying by high-frequency current, as a supplement to his Paper on this subject. It was perhaps unfortunate that this process was described as most suited for plastic binders when these were in such "bad odour" as a result of previous comments in the practical session. Mr. J. C. Lowson (B.T.H.) presented some aspects of the possibility of core drying by infra-red electric lamps, but a *volte face* was reported by Mr. A. C. Jennings, of the Sheffield Gas Company, Limited, who said he would hesitate before recommending infra-red drying by gas for cores. In the final Paper, Mr. W. West (Leyland Motors, Limited) contrasted American methods of core-blowing, which used the vertical system, with those used in this country.

The conference was ably summed up by the Chairman, who expressed the hope that the suppliers now had a picture of what the foundryman required. He thought the practical men present had gained an insight into what was available (that word being stressed from the supply angle) and that they would be able to further their researches in the light of their newly acquired knowledge. The conference was considered to be a success, although there was general feeling that some of the subjects deserved more detailed study had time allowed.

*Dr. Rees sponsored, and himself carried out, much of the early work during the war on core-bonding substitutes at Sheffield University on behalf of the Ministry of Supply.

Standard Method for Creep Testing

The British Standards Institution has recently published A.23:1948, Equipment and method for long period, high sensitivity, tensile creep testing. This standard covers the essential requirements for testing equipment and method of test to cover tensile creep (total plastic) strains down to 0.001 (0.1 per cent.) and in periods up to 10,000 hours. It is applicable to standard tests on bars, plates, sections, sheets, and cast or forged parts of sufficient size. Details are given in sections 1 and 2 of the recommended test specimen and requirements are stated for the testing machine, thermocouples, temperature indicators and control, and extensometer. Section 3 describes the test method and includes details of the preparation of the specimen, the checking of the instruments and the presentation of results.

Notes from the Branches

Newcastle-upon-Tyne

This branch, pursuing their policy of increasing the knowledge of foundrymen in related industries, visited the works of the Consett Iron Company, Limited, on October 9. Ninety members journeyed in coaches for the 15-mile run up the Derwent valley. On arrival at the works, the extent of which astonished many members, they received a warm welcome. The company are large suppliers of steel plates, sheets and sections, as well as coke, silica-bricks and shapes, and the hugeness of the plant can be envisaged. The party was split up into groups, which were taken through the various sections in charge of expert and informative guides.

The general equipment and the spacious buildings were much admired; in particular, the blast furnaces with their up-to-date methods of control attracted much attention. Members were able to see the complete cycle of operations from the ore-handling plant, charging and operation of the furnaces, steel-making and casting of ingots, blooming and cogging to the rolling of plates, sheets and sections. Many of the visitors spent a good deal of time closely watching the methods used at Consett in furnace building, lining and repairing, such work being somewhat more closely related to their own.

The strenuous morning in the works enabled them to do full justice to the excellent luncheon given by the firm. After the repast, Mr. S. Unsworth, the Branch-President, and an official of the Consett Company, conveyed a message of apology from Mr. H. Boot, their General Manager, for his inability to be present that day to welcome them, and his hope that they would enjoy the visit. Mr. H. Smith, senior Vice-President, asked Mr. Unsworth to thank Mr. Boot on behalf of the members for the invitation to visit Consett and for the attention and kindnesses extended to them.

House Organs

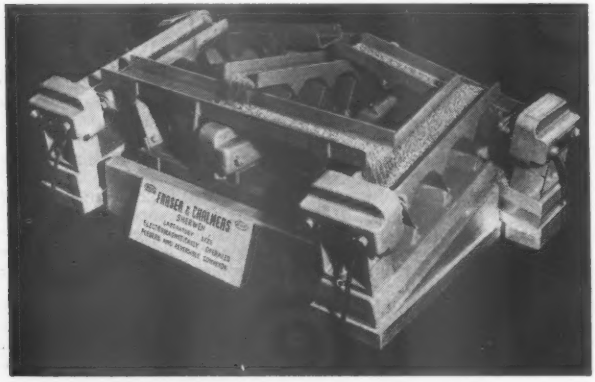
Malleable Iron Facts. Being No. 32 of the Bulletin of the [American] Malleable Founders' Society, Union Commerce Building, Cleveland, Ohio.

This issue is devoted to the publicising of pearlitic malleable cast iron by impressing upon readers its extra wear-resistance and increased hardness over the standard product. It carries interesting illustrations of typical castings and photomicrographs (unfortunately these are printed in dark brown) of its structure.

The Stantonian. Volume 16. Number 9. Published by the Stanton Ironworks Company, Limited, near Nottingham.

The most important article in this issue is an account of a talk given by Mr. L. Rawlins, the export manager, to the foremen. Only those intimately concerned with the handling of overseas business can give a balanced picture of the interrelationship of works production and exports. This is an ideal subject for the agenda of any works joint production meeting. The rest of the issue is, as it should be, mainly of internal interest.

"The Nickel Bulletin." Vol. 21, No. 8/9.—This issue features an article, with a number of illustrations, on electro-formed moulds for plastics and die-casting dies. The main advantage of this process lies in the relative ease of cutting, finishing and checking a positive master, as compared with a negative cavity in steel. It gives high accuracy and the possibility of reproducing forms which would be expensive or unobtainable by other means. Among the abstracts published in this issue there is interesting material on ore-treatment processes, under the heading "Metallurgical Improvements in the Treatment of Copper-Nickel Ores," together with a wealth of data under other sections. Copies of "The Nickel Bulletin" can be obtained, free of charge, on application to the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.



Electromagnetic Conveyor

Illustrated on the left is a laboratory model of the "Sherwen" electromagnetic reversible conveyor which was exhibited on the Fraser & Chalmers stand at the Mechanical Handling Exhibition.. It is of the vibrating trough type and possesses the novel feature that movement of the material is made reversible in a positive fashion by two separately controlled vibrators. This type of conveyor is being developed, in collaboration with the General Electric Company, Limited, for the conveying of foundry sand.

Strength and Deformation Recorder

A strength and deformation recorder (Fig. 1) has been developed by the Harry W. Dietert Company, of 9330, Roselawn Avenue, Detroit, Michigan, U.S.A., which may be attached to the Universal sand strength machine. This recorder may be used for either the green compressive strength test on the A.F.S. 2 in. × 2 in. sand specimen, or for the A.F.S. core transverse strength test where a 1 in. × 1 in. × 8 in. baked core specimen is used. The recorder draws the stress-strain diagram on a printed chart which is ruled to show the compressive

FIG. 1.—STRENGTH-DEFORMATION RECORDER FITTED TO A UNIVERSAL SAND-STRENGTH MACHINE.

strength in. lb. per sq. in. or load in pounds for the core transverse strength. The deformation is measured on the horizontal axis with a ruler reading to 0.001 in. deformation in the case of the compression test, and 0.001 in. deflection in the case of the baked core transverse test. The recorder is accurate to within 0.0005 in. It is driven by a synchronous motor, normally in an electrically-braked position. A small amount of deformation or deflection of the test specimen releases the electrical brake, causing the recording pen to traverse either to the right or left. The recorder pen thus records any change in the length of the test specimen or any bending in the case of a transverse test specimen.

Measurement of Plasticity

The recording pen is moved along the load axis by the position of the loading pendulum, thus recording on the vertical axis of the diagram. The system is in perfect balance with the loading pendulum. The workable strength of a moulding material is not necessarily fully measured by the compressive strength, since the degree of plasticity or degree of brittleness which may be present is only measured by the deformation. The workable strength of a moulding material, such as moulding sand, for example, may be expressed in a single factor termed "sand toughness number." The "sand toughness number" is the product of compressive strength and deformation multiplied by 1,000.

A moulding sand possesses a stress-strain curve in which the stress is proportional to the strain for a certain distance. In this respect, moulding sand is similar to steel. However, moulding sand has no recovery when load is removed. Thus it does not have an elastic limit. It does have a "yield" load limit where the proportionality between stress and strain ceases to exist. The term yield load is used for want of a better term. The yield load point for a group of moulding sands is not a fixed percentage of the ultimate load. In some cases, the yield load is as high as 75 per cent., or in other cases as low as 30 per cent. of the ultimate. Moulding sands will not support any additional load after the yield load point is reached for an extended period. Thus the plastic load point should be used in evaluating the true strength of moulding sands. The point on the stress-strain diagram when the diagram departs from a straight line is noted as the yield load, and is expressed in lb. per sq. in. The amount of deformation at this point may be easily measured with a special deformation scale.

Application to Cores

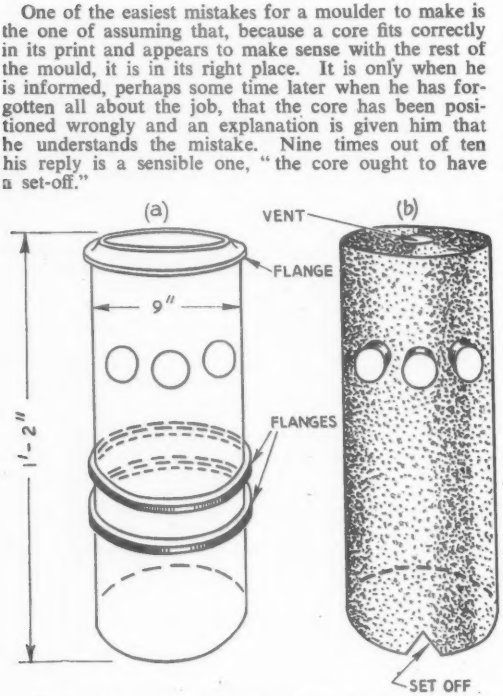
The deflection of a baked core is of great interest to foundrymen. Many slender cores are supported in moulds between chaplets or core prints. Their own weight or the buoyancy in molten metal will exert a force to bend the core, which may result in a defective casting. The strength-deformation recorder may be used to measure the load carrying ability and the amount of deflection of a baked core. Two cores may show the same strength, but one may deflect 0.005 in. and the other may deflect as much as 0.040 in. The core with the least amount of deflection needs the smallest number of chaplets and will produce the straightest cored holes. The core breakage in handling is also the lowest for cores of low deflection. The degree of stiffness of a core may be controlled by proper selection of material, processing and baking, and such control offers an opportunity for producing better castings.

A FOREMAN WAS KILLED and four others (including two French mechanics) were injured in an accident at Blackness Foundry, Dundee.

The Importance of Set-Offs

By W. Gudgeon

One of the easiest mistakes for a moulder to make is the one of assuming that, because a core fits correctly in its print and appears to make sense with the rest of the mould, it is in its right place. It is only when he is informed, perhaps some time later when he has forgotten all about the job, that the core has been positioned wrongly and an explanation is given him that he understands the mistake. Nine times out of ten his reply is a sensible one, "the core ought to have a set-off."



Illustrated above is an example of a case where the moulder's suggestion of some sort of a guide is a practical one. With the exception of three flanges, it represents a plain cylinder, with six small holes equally spaced round the casting, the holes being formed by cores which project on the body core, and which leave the corebox so attached.

The core is made in halves and jointed when dry and a casual glance at it would estimate the small cores as being near the middle of the mould, whereas they are intended to be $\frac{1}{8}$ in. past the centre line; hence the need for the set-off indicated on the core.

It is surprising the number of times doubts arise and explanations are necessary, or a blue-print has to be examined before the moulder is convinced he has set a core in its right position in the mould.

For a further example, a name-core (without a set-off) can be so placed in the mould that the name will be upside down on the casting. Again, where a number of cores has to be set in a mould and there is no pat-

(*Concluded at foot of column* 2.)

ternmaker or drawing immediately available, one core in the number may cause uncertainty and discussion, whereas a set-off as a guide would ensure correct positioning.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CLEANING OF STEEL CASTINGS

To the Editor of THE FOUNDRY TRADE JOURNAL

SIR,—Mr. A. B. Lloyd's experience that "Scotch mist" has an effect of laying dust is a general one, I think, but few people understood that such mist exists in the shop outside a Hydro-Blast cabinet and even now I am uncertain if that is Mr. Lloyd's meaning.

My suggestion of impregnating cores with moisture was for foundries possessing no Hydro-Blast. Also, it was not with the idea of facilitating the removal of cores, but solely to prevent dust arising during the process. As far as experiments have gone, ironfoundry core-sand (as it exists in a casting after cooling-off) is rendered dustless when it has absorbed as little as 1 per cent. by weight of water.

Mr. Lloyd is to be thanked for raising a subject of such importance. I would like him to know that my remarks are intended as an addition to, and not critical of, his valuable Paper and findings.

Yours, etc.,
HORACE J. YOUNG

15, Lansdowne House,
Manchester, 20.
October 28, 1948.

"NO SUPPLIES AVAILABLE"

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In your excellent paper you quote "Foundry Iron—Cleveland No. 3 Middlesbrough, £9 16s. 9d." Can you inform me where such iron can be bought? I know you cannot answer that question, as for a long time now no blast furnace in the Cleveland district has been loaded for foundry iron.

Consequently, all foundry iron used in the local iron-foundries has to be imported from the Midlands, *etc.*, thereby wasting much truck space and locomotive power. The conclusion is obvious.—Yours, etc.,

GERALD D. COCHRANE,
Managing Director.

James & Ronald Ritchie, Limited,
Acklam Foundry, Middlesbrough.

[The price quoted by us is the official price and there no doubt are good commercial reasons for keeping the name of this product before the public.—EDITOR.]

IN CONJUNCTION WITH the International Housing and Town Planning Exhibition which is to be held at Olympia, London, from November 9 to 18, there will be a conference on "Living in Town and Country." This will take place in the Conference Room of the Empire Hall from November 10 to 12. The opening session will be presided over by the Rt. Hon. Lewis Silkin, M.P., Minister of Town and Country Planning.

Export Targets for 1948

Effect of Import Restrictions and Growing Competition

Mr. Harold Wilson, President of the Board of Trade, announced last week that the overall export target for British industry for end-1949 has been fixed at 155 per cent. of the 1938 volume, which compares with the provisional figure of 160 per cent. which he gave in the House of Commons in September. Although the end-1948 target was within sight of achievement, the Minister said that some slowing-down must be expected in the rapid rate of expansion which had occurred during the past eight months. The 1949 targets have had to be reduced in some instances, largely because of severe import restrictions abroad and growing competition for overseas markets. Mr. Wilson also said that, moreover, defence requirements may further limit the availability of scarce materials for use in export industries. The targets were, he said, realistic and well within the capacity of British industry to achieve.

Referring to coal, Mr. Wilson said that, assuming that there was no substantial fall in price, they ought to see coal going up to 57 per cent. of the 1938 volume by the end of next year. The target in the case of iron and steel was not the one they were asking industry to expand to at all costs. Because of shortage of steel, the end-1949 target represented the minimum exports essential, first, to meet our demands under bilateral trade agreements; secondly, to meet the needs of colonial development schemes, and thirdly, for tinplate shipments required against our food import arrangements.

Non-ferrous metals targets were down for two reasons. First, there had been fairly heavy shipments, particularly of processed gold, and as a result of representations made by the International Monetary Fund from a currency point of view these figures would be reduced, and, secondly, as a result of reducing our imports of certain raw materials from dollar sources.

Despite continued steel shortage, considerably more exports of machinery were expected in 1949, always providing defence needs did not affect the industry too greatly, in respect of either steel supplies or manufacturing capacity. Exports of agricultural machinery, including tractors, which had been one of our most successful achievements this year, and also electrical machinery, were expected to increase.

Export targets for the end of 1948 and 1949 are summarised in the accompanying table.

Summary of Export Targets for the End of 1948 and 1949.

	£ million (monthly rates).		Percentages of 1938 by volume.	
	End 1948.	End 1949.	End 1948.	End 1949.
Raw Materials.				
Coal	3.90	6.00	39	57
Other raw materials	2.10	2.65	44	56
Total	6.00	8.65	83	113
Manufactures.				
METALS AND METAL PRODUCTS				
Iron and steel manufactures	8.10	8.50	111	116
Non-ferrous metals and manufactures	4.55	4.00	207	182
Cutlery, instruments, etc.	3.77	4.27	213	241
Electrical goods	7.07	7.55	252	270
Machinery	22.06	24.48	206	228
Vehicles, inc. ships, aircraft and tyres	21.10	21.80	255	263
Total	66.65	70.60	201*	212*
OTHER MANUFACTURES				
Chemicals, etc.	8.05	9.00	184	206
Coke and manufactured fuel	0.10	0.60	24	75

* Excluding rubber tyres.

N.E. Coast Engineers and Shipbuilders

Institution's Revised Articles

The annual report of the North East Coast Institution of Engineers and Shipbuilders, to be submitted at the annual meeting on November 26, says that the articles of association and the by-laws have been altered and it is now provided that the number of vice-presidents shall be eight instead of 18, and the term of office shall be eight years instead of six; also that the ordinary members of council be increased from 15 to 24, with the term of office increased from three to four years.

The constitution of the Institution being legally that of a company "limited by guarantee," the provisions of the Companies Act, 1948, apply to it. The council will submit a special resolution embodying the alteration of the articles of association necessary to permit the retention of members of the council of 70 years and over. Unless this change is made, many senior and honoured *ex-officio* members of the council—past-presidents and fellows—would be debarred from service on the council.

Industrial Safety Regulations

A world-wide model code of safety regulations in industrial establishments is to be recommended to all member States of the International Labour Organisation as a basis for framing and revising safety regulations in factories. The code was unanimously adopted by delegates at a conference at Geneva. The 15 chapters of the model code include detailed specifications on the provisions to be made to protect workers in industrial establishments. In general, it is provided that employers shall ensure that work places "are so constructed, equipped, arranged, operated, and conducted as to afford reasonable and adequate protection to their employees against accident and injury to health."

Several chapters deal with the health protection of the worker, his personal protective equipment, the selection of workers, medical aid, and physical examination. Certain special provisions also deal with the co-operation of workers in the improvement of industrial safety and hygiene.

Distribution of Industry

Situation in the Development Areas

Distribution of industry policy is one means of obtaining a high and stable level of production and of employment. Many departments of the Government are concerned, but the Distribution of Industry Act, 1945, laid certain special responsibilities upon the Board of Trade. Among these was the duty, to be discharged as regards Scotland jointly with the Secretary of State for Scotland, of reviewing the boundaries of the Development Areas three years from the passing of the Act. This is the occasion for a Government White Paper (Cmd. 7540, H.M. Stationery Office, price 1s.).

Historically the Development Areas of to-day grew out of the old Special Areas. The Paper therefore goes back to the days of the Special Area Commissioners, and gives some account of wartime developments, tracing the course of events from the first steps taken in the 'thirties to the wider conception of the Government's responsibilities expressed in the Distribution of Industry Act, 1945, and in Section 14 of the Town and Country Planning Act, 1947, and Section 12 of the Town and Country Planning (Scotland) Act, 1947.

The Paper examines in some detail the results which have followed, partly from wartime developments and partly from the operation of the policy adopted, not only in the Development Areas where they are most apparent, but in the rest of the country. On the negative side, the Government has restricted new industrial development in parts which were already congested with industry; and on the positive side, it has in a variety of ways, through the willing co-operation of many industrialists who wished to extend their factories or to start fresh enterprises, assisted the Development Areas and other parts which needed more industrial employment. But it has recognised that in some cases there were sound economic reasons why movement to these areas was impracticable.

The situation in the Development Areas, it is stated, has changed for the better, both absolutely and relatively to the country at large. Not only is unemployment in the Development Areas now much smaller than it was shortly before the war, but employment is much greater. The 100,000 insured persons out of work to-day contrast with some 410,000 in 1937 and 820,000 in 1932; 250,000 more are now in work than in 1939, 400,000 more than in 1937, and 800,000 more than in 1932. By June, 1948, 443 new factory buildings had been completed in the Development Areas since the war. Yet the programme of industrial growth is still only at the half-way mark. When it is complete it is felt that there should no longer be a special danger of heavy localised unemployment in most parts of the Areas. There will be more of the industries which have been less liable to depression than some of the basic industries in which the largest proportion of workers was previously engaged; and the existence of a wider range of industries will mean that a recession in any one of them will have less effect on the economy as a whole. Other areas of the country in which there is any fear of serious unemployment, should, the Paper states, also be better equipped to resist it.

Obituary

MR. NEIL STEWART M'MURTRIE, formerly of the Glasgow Iron & Steel Company, Limited, died on October 20. He was 79.

MR. ANDREW TAIT, who died in hospital on October 21, was proprietor of James Stewart & Company, engineers, of Edinburgh.

MR. THOMAS KERSHAW MARLER, principal of Thomas Marler & Sons, metal merchants, of Dukinfield, Ches, has died at the age of 74.

MR. JAMES AMOS CORDER, of Dorman, Long & Company, Limited, Middlesbrough, died on October 23 after a short illness. He was 62.

MR. HARRY RAYMOND WILKES, who died at his home on October 18, was works manager of the Bloxwich Lock & Stamping Company, Limited. He was 50.

MR. GEORGE HAMILTON ROACH, former managing director of H. Stockwell & Company, Limited, iron and steel stockholders, of Manchester, died suddenly on October 23.

MR. FRANK CECIL MANNOX, who died suddenly on October 21 at the age of 49, was managing director of Murex, Limited, Rainham, Essex. He took over the management of the company in 1942, shortly after the death of Mr. H. A. Green.

COL. F. E. SHIRLEY BEAVAN, managing director of Mountstuart Dry Docks, Limited, Cardiff, and its associated companies, died on October 26 at the age of 58. He was president of the Shipbuilding Employers' Federation in 1944 and had been president of the Bristol Channel Ship Repairers' Associations on five occasions.

MR. WILLIAM SMITH PAIRMAN, chairman and managing director of Lambhill Ironworks, Limited, Glasgow, died recently. Mr. Pairman, who was 62 years of age, was chairman of the Scottish Structural Steelwork Association, chairman of J. H. Carruthers & Company, Limited, pump makers, of Glasgow, and a director of other companies.

SIR WILLIAM PETER RYLANDS, Bt., chairman and managing director of Rylands Bros., Limited, manufacturers of wire, wire netting, etc., of Warrington, Lancs, died on October 22, on the eve of his eightieth birthday. He was interested in many companies and many organisations. He was one of the founders and twice president of the Federation of British Industries. He was president of the Iron and Steel Institute from 1926-27, president of the National Federation of Iron and Steel Manufacturers in 1930, while for 37 years from 1900 he was president of the British Iron and Steel Wire Manufacturers' Association. Sir Peter was chairman of the Pearson & Knowles Coal & Iron Company, Limited, the Whitecross Company, Limited, and Wolstanton, Limited, and a director of the Lancashire & Corby Steel Manufacturing Company, Limited, the Lancashire & Corby Steel Selling Company, Limited, the Lancashire Steel Corporation, Limited, a member of the London board of the Broken Hill Proprietary Company, Limited, while he was also a director of the District Bank, Limited, and a member of the boards of other companies. He was knighted in 1921 and created a baronet in 1939.

Company News

(Figures for previous year in brackets.)

Willowbrook—Dividend of 10% (same).

Ferranti—Dividend of 6%, tax free (same).

Metal Products—Interim dividend of 2½%.

Sadler & Company—Dividend of 5% (same).

Hopkinsons—Interim dividend of 7½% (same).

G. & J. Weir—Interim dividend of 10% (same).

Metal Closures—Interim dividend of 20% (same).

Manley & Regulus—Interim dividend of 5% (same).

Senior Economisers—Interim dividend of 25% (nil).

Amal—Dividend of 10% and bonus of 5% (same).

Laporte Chemicals—Interim dividend of 5% (same).

Gaskell & Chambers—Interim dividend of 5% (same).

Pressed Steel Company—Interim dividend of 10% (same).

Light Production Company—Interim dividend of 10% (nil).

Thos. W. Ward—Final dividend of 10%, making 15% (same).

Warne, Wright & Rowland—Interim dividend of 15% (same).

Arthur Lee & Sons—Final dividend of 30%, making 45% (same).

Mellor, Bromley & Company—Interim dividend of 17½% (same).

Wolverhampton Metal Company—Interim dividend of 20% on increased capital (20%).

Ductile Steels—Final dividend of 25% (17½% and bonus of 15%), making 45% (same).

Serck Radiators—Final dividend of 20%, making 30% (30% including bonus of 5%) for the period from August 3, 1947, to July 31, 1948.

Fleming & Ferguson—Final dividend of 10%, making 15% (same, plus distribution of 3%, not subject to tax, from profit on sale of investments).

International Diatomite Company—Interim dividend of 10% (7½%). The directors have decided to close the accounts in future at June 30 instead of March 31.

Clear Hooters—Trading profit to August 4, £28,814 (£32,221); to taxation, including reserve, £14,988 (£23,056); final dividend of 25%, making 40% (same); forward, £17,598 (£10,319).

Eva Bros.—Interim dividend of 35% (28%). The directors state that the increased dividend is to equalise payments and must not be taken as an indication of an increase in the final dividend.

Irish Ropes—Profit for the year to August 31, £9,789 (£10,753); transfer fees, £11 (£25); to directors' fees, £1,047 (£1,150); preference dividend, £1,993 (£2,025); tax, £2,215 (£2,145); ordinary dividend of 6 per cent. (same); reserve for contingencies, £5,000 (same); forward, £17,188 (£17,820).

Tinsley Rolling Mills Company—Trading profit for the year to June 30, £52,086 (£25,909); income on investment, £90 (same); to taxation, £20,750 (£11,000); depreciation, £3,947 (£1,064); directors' emoluments, £8,814 (£4,500); audit fee, £184 (£105); net profit, £18,481 (£9,330); dividend of 15% (same); to general reserve, £13,000 (£5,000); deferred repairs, nil (£2,000); forward, £14,266 (£13,020).

Joshua Bigwood & Son—The next accounts will be for the 15 months ending December 31, 1948 The directors, who paid an interim dividend of 5% in May last, state that they anticipate paying a second interim dividend in December next, so that shareholders will receive the same dividend this calendar year as the 15% paid in 1947. A final distribution is expected to be paid in April or May.

Hardypick—Trading profit for the year to June 30, £63,691 (£46,916); other income, £259 (£625); to taxation, including adjustment previous years. £27,834 (£14,000); directors' emoluments, £8,514; depreciation, £10,000 (£11,000); net profit, £17,603 (£22,124); unclaimed dividend written off, £15 (nil); to dividend of 10% and bonus of 2½% (same); general reserve, £10,000 (£15,000); staff superannuation, £699 (£899); forward, £12,248 (£11,296).

R. & W. Hawthorn, Leslie & Company—Profit on contracts and orders for the year ended June 30, £444,335; interest and dividends, £43,951; other income, £2,905; to directors' fees, remuneration, etc., £30,733; depreciation, £52,439; tax, £231,000; net profit, £177,019 (£209,487); to dividend of 10% (same) and bonus of 10% (same); bonus of 1%, tax free, from interest on tax certificates (same); general reserve, £100,000 (£75,000); forward, £116,453 (£98,549).

Parsons Marine Steam Turbine Company—Profit on manufacturing and royalties account for the year to June 30, £107,879 (£118,016); other income, £22,524 (£23,064); to taxation, £64,727 (£65,500); experimental pioneer and development work, £9,230 (£4,426); directors' emoluments, £12,483 (same); net profit, £21,169 (£40,879); final dividend of 9½%, making 12½% (15%); forward, £23,902 (£29,521, less profits tax arising on retrospective increase in rate £5,000).

Thomas Blackburn & Sons—Trading profit for the year ended June 30, £114,205 (£47,382); to directors' fees, £1,600 (£900); pension to former director, £300 (same); interest, etc., £3,172 (£2,600); employees' superannuation, £3,426 (£2,834); depreciation, £8,846 (£10,931); net profit, before tax, £96,861 (£29,817); to taxation, £53,000 (£16,000); deferred repairs, £3,000 (nil); plant replacement reserve, £10,000 (nil); general reserve, £10,000 (£4,000); dividend of 10% (same); forward, £17,901 (£6,170).

Lake & Elliot—Trading profit for the year to July 31, £158,774 (£74,907); other income, £195 (£678); to taxation, £70,607 (£26,391); depreciation of fixed assets, £22,464 (£11,358); written off tools, equipment, etc., £4,453 (£3,885); pensions, £6,227 (£5,674); auditors' remuneration, £500 (same); reserve for deferred repairs and improvements, £36,500 (nil); net profit, £18,218 (£27,777); to preference dividends, £3,660 net (£4,211); ordinary dividend of 20% (same); premium on redemption of preference shares, nil (£10,537); forward, £75,418 (£66,360).

Baldwins (Holdings)—Income from investments, etc., for the year ended September 30, £526,083 (£538,504, including £21,468 (£11,808 net) from investments in Guest Keen Baldwins Iron & Steel Company in excess of one year's income); to directors' fees, £4,036 (£4,962); expenses, £5,793 (£5,915); taxation, £236,077 (£239,077); net balance, £280,177 (£288,550); final dividend of 11%, making 16% (same); forward, £87,805 (£83,462). The report states that the taxation liabilities in respect of periods prior to the merger in 1944 with Richard Thomas & Company have not yet been agreed.

Burt, Boulton & Haywood—Trading profit for the nine months to March 31, £112,124; foreign subsidiary income, £8,629; trade investments, £24,557; quoted investments, £3,085; property interest, £3,444; war damage interest, £2,014; fees, £17; to directors' fees, £7,120; other emoluments, £5,621; depreciation, £20,492; auditors' fees, etc., £700; deferred repairs, £7,667; debenture and investment redemption, £638; tax, £38,500; leaving £73,132; brought in, £20,370; to plant replacement reserve, £30,000; stock reserve, £12,500; preference dividend, £4,331; ordinary dividend of 5¼%, £15,009; workers' certificates, 5¼%, £465; forward, £31,197.

B. & S. Massey—Consolidated trading profit for the year ended March 31, plus investment income, £114,940 (£86,232); to depreciation, £12,563 (£10,200); directors' emoluments, £9,653 (£11,838); auditors' remuneration, £479 (same); mortgage interest, £412 (£450); mortgage redemption cost, £773 (nil); rehabilitation costs, nil (£1,019); profits tax (and E.P.T.), £10,470 (£8,250); profit, £80,590 (£53,996); to reserve for income tax, £31,900 (£24,150); aggregate net profit, £48,690 (£29,846); three months' subsidiary profit, £421 (£921); net profit of company after £10,169 (nil) retransfer from tax provision, less further provision for deferred repairs, and £3,072 (£4,499) for parent company's proportion of undistributed profit of subsidiary, £56,208 (£24,426); to reserve for replacement of fixed assets, £15,447 (nil); general reserve, £15,000 (nil); preference dividend, £1,146 (same); dividend on the old ordinary shares of 17½% (same); forward, £33,833 (£14,633).

John I. Thornycroft & Company—Group's trading profit for the year ended July 31 (including £95,000 in respect of delayed settlement of contracts completed prior to August 1, 1947), £702,829 (£647,915); other income, £3,385 (£102); to depreciation, £99,924 (£115,103); additional provision for deferred repairs, £751 (£30,652); benevolent fund, £10,000 (same); audit fees and expenses, £1,678 (£1,404); directors' remuneration, £22,820 (£22,575); tax (including £17,055 on profits for the year ended July 31, 1947), £314,828 (£353,832); profit, £256,213 (£114,451); provision for tax no longer required, £3,200 (nil); to parent company's general reserve, £175,000 (£50,000); subsidiary general reserve, £3,200; dividends (including profits tax) parent company, £76,097 (£60,797); forward: parent company, £102,454, subsidiaries, £35,711; net profit of parent company, £251,242 (£111,950); ordinary dividend of 15% (same) and bonus of 7½% (same); final dividend of 5½% (same) on participating preferred shares, making 9% (same); additional profits tax on dividends, £19,997 (£4,697).

Heavy Taxation "a Brake on Modernisation"

G.E.C. Extensions

Heavy taxation constituted a tax on capital and a brake on modernisation, said Sir Harry Railing, chairman of General Electric Company, Limited, at the annual meeting of the company on October 21. Unless altered it would more and more tend to nullify the measures for increased efficiency, for reduced costs, and for closing the gap in our external trade which industry was so valiantly striving to carry out.

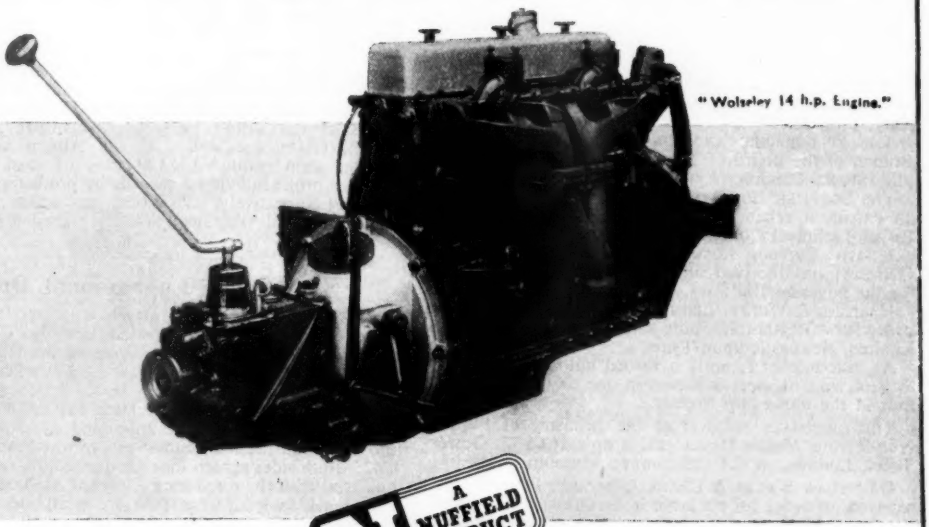
He announced that the company had a bank overdraft of £4,840,593 which had been mainly necessitated because of the present high cost of raw materials and for partly or wholly manufactured goods which now stood in the company's balance-sheet at £20,210,005. It was clear, he said, that owing to the heavy incidence of taxation it was becoming increasingly difficult to plough back sufficient profits to make good this drain on any progressive company's resources. "I repeat, therefore, as stated in my report last year, that at some future date a further permanent increase in capital will be required to finance the company's expansion." Replacement costs had more than doubled, yet amounts ploughed back into businesses were now heavily taxed and it was becoming increasingly difficult to provide, out of a company's savings, the necessary reserves for capital replacement, let alone modernisation.

With regard to the distribution of the company's income, Sir Harry pointed out that it paid in taxation more than four times the amount paid out in dividends. If dividends and profits reinvested in the company were added together, the Government's share was 33.3 per cent. more than the combined total.

The General Electric Company, Limited, has announced that, to meet the nation's urgent demands for power station generating plant, it is spending more than £1,000,000 on extensions to its electrical engineering works at Birmingham and to corresponding extensions at its mechanical engineering works at Erith, Kent.

The new extensions, which will include a new turbo-alternator works capable of manufacturing generators of 130,000 h.p.— almost twice the size of the largest standard units at present being made in this country— will enable the company almost to double its output of power station generators. Work on the extensions is to start immediately and it is anticipated that they will be in production within 18 months to two years.

THE ROYAL AGRICULTURAL SOCIETY is offering prizes to the value of £3,000 for new British machines or inventions for the collection and disposal of grass and/or forage crops for silage or artificial drying from the standing crop, swath or windrow, and for the collection and disposal of hay and straw from the windrow. Machines must have been constructed in Great Britain or Northern Ireland and must not have been publicly exhibited or offered for sale before January 1, 1940.



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ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

News in Brief

LITHGOWS, LIMITED, Port Glasgow, has received an order to build a tanker of 16,000 tons dw. for Norwegian owners.

THE 15,000-TON LINER Almanzora is to be broken up at Blyth by the Hughes Bolckow Shipbreaking Company, Limited.

THE TELEGRAPHIC ADDRESS of the Export Licensing Branch of the Board of Trade has been changed to Explic, Stock, London.

THE SCOTTISH EDUCATION DEPARTMENT has approved an extension scheme in Montrose Street for Glasgow Royal Technical College.

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Glasgow, has received an order for nine locomotives for the Nigerian Railways.

HARLAND & WOLFF, LIMITED, Belfast, has received an order for a 12,000-ton motor tanker for Common Bros., Limited, Newcastle-upon-Tyne.

AT ARDROSSAN recently a record unloading of 3,185 tons of iron ore was achieved in one day out of 4,874 tons in the motorship Bretagne.

THE DISPOSALS SECTION of the Ministry of Supply Non-ferrous Metals Directorate is now at 66-72, Gower Street, London, W.C.1 (telephone: Museum 8044).

GRANTHAM BOILER & CRANK COMPANY, LIMITED, has received an order for six large boilers for use in Indian coal mines. They are the largest boilers ever manufactured by the company.

DORMAN, LONG & COMPANY, LIMITED, Middlesbrough, announces that a recent week's aggregate output of steel at its various works reached a total of 33,498 tons, a record in the history of the company.

TWO HUNDRED WORKERS employed at the Hillington Works (Glasgow) of L. Sterne & Company, Limited, refrigeration engineers, have received notices of dismissal because of a reduction in the number of orders for certain types of plant.

BEYER, PEACOCK & COMPANY, LIMITED, Manchester, announces that 10 of the 60 heavy articulated locomotives ordered from the company by Rhodesia Railways have been delivered and a further batch of 20 is to be shipped before the end of the year.

JOHN CROWN & SONS, LIMITED, Sunderland, has received an order for two tankers, each of 3,000 tons dw., for the Anglo-Saxon Petroleum Company, Limited. Propelling machinery (Diesel engines) will be installed by R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-upon-Tyne.

ORDERS FOR about £4,500,000 worth of Diesel electrical generating sets have been obtained by J. & H. McLaren, Limited, Leeds, a subsidiary of Associated British Engineering, Limited. Over £3,500,000 of the orders are for Russia under the Anglo-Soviet trade agreement of last year.

AN EXTRA-ORDINARY MEETING of Crossley Bros., Limited, manufacturers of Diesel and gas engines, etc., of Manchester, adopted a new article of association which excludes the necessity for the present directors of the company to retire at the age of 70, as laid down by Section 185 of the Companies Act, 1948.

THE DIRECTORS OF R. & W. Hawthorn, Leslie & Company, Limited, marine engineers and shipbuilders, of Newcastle-upon-Tyne, in their report for the year ended June 30 state that the company's establishments were fully employed throughout the year. They add, however, that concern is being felt on account of shortages in essential materials.

FOUR WEEKLY steel output records were broken at the works of the Briton Ferry Steel Company, Limited, Neath, Glam, recently. At the Albion Works the melting shop produced 4,147 tons of steel and two furnaces broke individual records by producing 682 and 903 tons respectively. The joint production record of the Albion and Old Steel Works reached a new peak of 5,867 tons.

Control of Engagement Order

The National Joint Advisory Council, at its meeting last week, unanimously advised that the Control of Engagement Order should be renewed until the end of 1949, when the position should again be considered. The Order is due to expire on December 31 next. The Council also unanimously declared in favour of deferring for a further year the appointed day for bringing into operation the Restoration of Pre-war Practices Act, 1942. Both sides agreed that the desirability of avoiding industrial disturbance during a period of economic difficulty—which led to the previous postponement—still existed.

Mr. George Isaacs, Minister of Labour, announced that invitations had been extended to the managements of socialised industries to appoint representatives to sit on the Council.

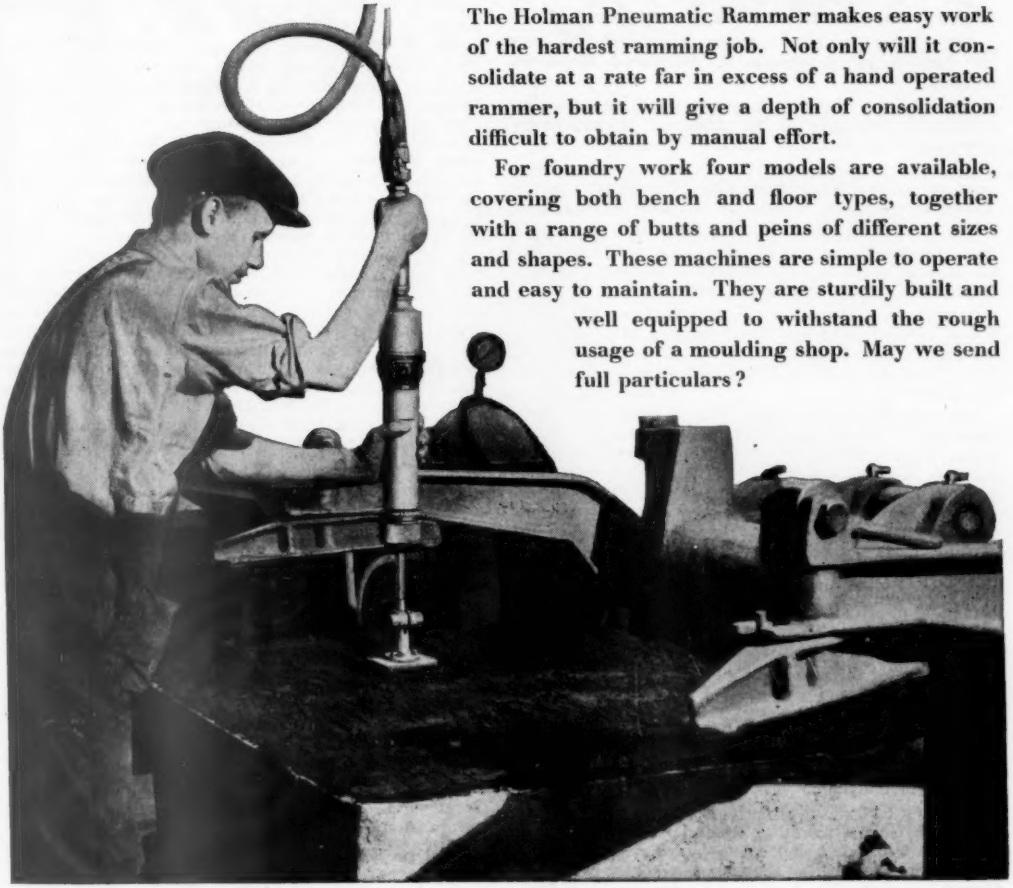
Export Quotas: B.O.T. Statement

From time to time the Board of Trade is asked by exporting firms whether goods may be delivered from the export quota to residents of the United Kingdom against payment from accounts in other parts of the sterling area. The Board states that such transactions are directly contrary to the national interest. They should not appear as exports in the returns made by industry, nor should they be recorded against export targets. At a time when scarce raw materials, such as steel, are vitally needed for export production, it is clear that the whole aim of the export drive is being defeated if goods produced with raw materials allocated for export are allowed to find their way on to the home market by devices of this kind.

Production of Diesel Rollers in India

The first Indian-built Diesel road roller was christened in traditional fashion at the works of Jessop & Company, Limited, Calcutta, on Saturday. The design adopted is that of Aveling-Barford, Limited, Grantham, suitably modified for Indian conditions. A large proportion of the parts was manufactured in Ordnance factories of the Government of India. The scheme involves the production of 500 rollers, each of 8 to 10 tons.

RAMMING IT HOME



The Holman Pneumatic Rammer makes easy work of the hardest ramming job. Not only will it consolidate at a rate far in excess of a hand operated rammer, but it will give a depth of consolidation difficult to obtain by manual effort.

For foundry work four models are available, covering both bench and floor types, together with a range of butts and peins of different sizes and shapes. These machines are simple to operate and easy to maintain. They are sturdily built and well equipped to withstand the rough usage of a moulding shop. May we send full particulars?

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Personal

MR. ALFRED AUGSTEIN is now residing at 4, Rathbone Place, London, W.1.

MR. J. E. JAMES has retired from the board of the Wellman Smith Owen Engineering Corporation, Limited.

MR. C. G. COLLINGS has been appointed a director of Steel Barrel, Scammells & Associated Engineers, Limited.

MR. HAROLD DAWSON ROBERTS has been appointed commercial manager to the Affiliated Manufacturers' Association of the Cable Makers' Association.

MR. IAN M. SMITH has been appointed engineering manager of the Ailsa Shipbuilding Company, Limited, Troon, in succession to the late Mr. John M'Naughton.

MR. F. V. ALLEN, of the Cleveland Works of Dorman, Long & Company, Limited, has received a presentation to mark his appointment as assistant electrical engineer of the company's Britannia Works.

MR. E. F. ELLIOT, the surviving founder of Lake & Elliot, Limited, iron and steel founders, etc., of Braintree, Essex, is retiring at the annual meeting to be held next Monday, after an association with the company of 52 years.

MR. BRINLEY JONES has resigned his position as senior metallurgist in the metallurgical and research department, Vickers Works, of the English Steel Corporation, Limited, to join the Climax Molybdenum Company of Europe, Limited, as manager.

MR. G. M. SMIBERT, a director of the North Eastern Marine Engineering (1938) Company, Limited, Wallsend, has been appointed chairman of the Tyneside District Advisory Committee of the Northern Regional Board for Industry. Mr. R. S. Chipchase, chairman and managing director of the Tyne Dock Engineering Company, Limited, has also been appointed to the committee.

MR. E. G. PLUCKNETT has been appointed director responsible for the sales policy and commercial organisation of the Simplex Electric Company, Limited (a subsidiary of Tube Investments, Limited). MR. W. FOSTER, Northern area manager, succeeds Mr. Plucknett as general sales manager of the Creda division and will in future be located at the company's head office at Oldbury, Birmingham.

MR. W. R. JONES, formerly works manager of the Hartlepool engine works of Richardsons, Westgarth & Company, Limited, has been appointed resident manager of the Southwick (Sunderland) engine works of George Clark (1938), Limited, a subsidiary company. He succeeds MR. A. J. SCHAEFFER, who has returned to the Wallsend headquarters of Richardsons' other subsidiary, the North Eastern Marine Engineering Company (1938), Limited.

MR. JOHN G. WRIGHTSON, a director of Head, Wrightson & Company, Limited, engineers, founders, etc., of Thornaby-on-Tees, DR. J. W. ARMIT, a director of the Wilton Works of Imperial Chemical Industries, Limited, MR. STEPHEN N. FURNESS, chairman of the Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees, MR. B. CHETWYND TALBOT, deputy chairman of the South Durham Steel & Iron Company, Limited, and SIR G. TRISTRAM EDWARDS, joint managing director of Smith's Dock Company, Limited, North Shields, and a director of the Consett Iron Company, Limited, have all been elected as members of the Tees Conservancy Commission.

MR. J. M. OSBORNE, managing director of Dorman, Long (Africa), Limited, and a director of the parent company, Dorman, Long & Company, Limited, Middlesbrough, has been appointed chairman of Dorman, Long (Africa), Limited, in succession to the late Viscount Greenwood. Mr. Osborne joined the bridge department of Dorman, Long & Company in 1926 and five years later became manager of the company's bridge-building activities. In January, 1935, he was appointed managing director of the Union Construction Company (Pty.), Limited, in which Dorman, Long & Company was substantially interested, a position he continued to hold when a fusion with Wade & Dorman, Limited, led to the formation of Dorman, Long (Africa), Limited. During the war Mr. Osborne was chairman of the Industrial Council of South Africa, served as a member of a Government committee reporting on war contracts, and from 1943 was a member of the South African Board of Supply. In May this year Mr. Osborne was appointed by the South African Government as a member of the Commission set up to investigate and advise on the wage position in the mining industry of the Union.

Wills

HINDMARSH, R. F., late chief engineer to the Tyne Improvement Commission £26,086

ENTICKNAP, N. A., joint secretary of the General Electric Company, Limited £18,051

WILKINSON, SIDNEY, a director of the Midland Steel Company, Limited, Wolverhampton £65,934

METCALFE, J. W., a director of the Darlington Railway Plant & Foundry Company, Limited £137,004

JACKSON, R. L., late of Edgar Allen & Company, Limited, steel manufacturers, of Sheffield ... £2,019

BEAMES, H. P. M., late chief mechanical engineer of the London and North Western Railway ... £8,517

HEPPENSTALL, T. H., formerly of the London office of the Shelton Iron, Steel & Coal Company, Limited £1,040

SMELLIE, JAMES, late managing director of James Smellie, Limited, brass and iron founders, etc., of Dudley £40,738

DORE, N. A., of Kingston-on-Sea, Kent, chairman of the Royal Metal Trades Benevolent Society from 1936 to 1946 ... ... £6,490

FLATHER, DAVID, a director of W. T. Flather, Limited, steel manufacturers, of Sheffield, and Master Cutler in 1926 ... ... £68,077

ARNFIELD, T. O., formerly joint managing director of J. C. Arnfield & Sons, Limited, textile machinists, foundrymen, etc., of Stockport ... £10,569

DAVIS, ALFRED, joint managing director and general manager of John G. Kincaid & Company, Limited, marine engineers and boilermakers, of Greenock... £26,411

BRACKENBURY, A. L., consulting marine engineer and ship surveyor, of Hull, late engineer and assistant works manager of Earles Shipbuilding & Engineering Company, Limited, Hull £3,710

JOHNSON, F. H., a director and secretary of Constructors, Limited, steel furniture manufacturers, of Birmingham, and a director of Poles, Limited, lighting standard manufacturers, etc., of Birmingham £14,165

MACNAB
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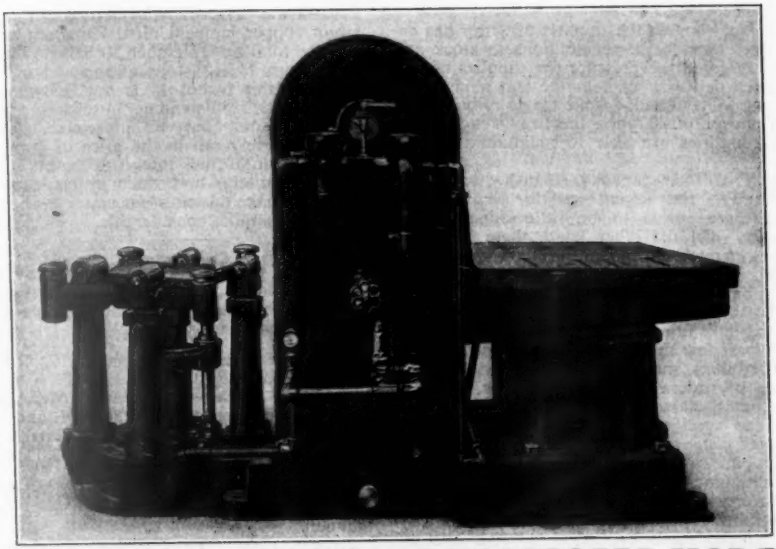

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Raw Material Markets

Iron and Steel

The reported changeover of a Derbyshire blast furnace from basic pig-iron to high-phosphorus foundry iron production should result in an increase of 1,000 tons per week in the output of the latter grade. Light foundries will be the immediate beneficiaries of this transfer, as it should ensure at least that tonnages booked by the furnaces will be delivered within the licensed period. Any increase in foundries' allocated tonnage generally will depend on quantities of iron available after the present heavy commitments of the furnaces have been reduced.

A marked expansion in the imports of scrap has enabled consumers to make some additions to stock and has also slightly eased the pressure for supplies of pig-iron. Substantial deliveries of hematite and refined iron are now coming to hand and, despite the scarcity of low- and medium-phosphorus grades, the heavy engineering and jobbing foundries are able to maintain full-scale activity.

To the limit of their capacity, British steelmakers are responding to the urgent call for semi-finished material and there seems to be little scope for any further increase. On the other hand, there has been an impressive increase in the imports of steel semis from Belgium. The September figures are by far the best for any month this year and October arrivals have been on a no less extensive scale. These are now helping to solve the difficulties of the re-rollers, whose outputs over the past few months have been restricted by the shortage of billets, sheet bars, etc.

The volume of orders in hand for plates, sections and, indeed, for all classes of rolled steel is most impressive. In the specifications received for the plate mills, the lighter gauges predominate, but a substantial call for heavy plates is expected to increase as the re-armament programme develops. Colliery requirements are expected to ease a little after current orders are executed and railway needs are restricted to maintenance levels. Special steels command a brisk sale in the home market and also figure in the export lists.

Non-ferrous Metals

Non-ferrous metals in the United States show a very firm price tendency; zinc has been advanced by half a cent to 15½ cents, with the virtual certainty that before long the level will be 16 cents per lb. On the domestic market, lead remains at 19½ cents, but there is every indication that another advance is imminent, for the Mexican producers are asking higher prices and the supply position remains tight. Generally, the belief is held that lead will increase by 2 cents to 21½ cents per lb., possibly this month, but it may be doubted whether this will be the end of the story, for the sellers' market is still firmly entrenched in so far as non-ferrous metals in America are concerned. From the British point of view, this upward tendency is very bad, for the country cannot afford inflated values when efforts are being made to close the gap of external expenditure. True, all metals are not bought from dollar areas, nor is every ton paid for in hard currency, but even the sterling countries such as Rhodesia base their selling prices on the New York quotation.

As was expected, consumption of copper improved in September (both July and August were affected by holidays). According to figures published by the British Bureau of Non-ferrous Metal Statistics, consumption of virgin copper in September increased by rather more than 4,000 tons in 29,836 tons, while the improvement in scrap usage was rather more—from 12,003 tons in August to 16,872 tons in September. Total consumption of copper, primary and secondary, in the nine months to September was 410,011 tons, or about 15,000 tons better than in the corresponding period last year. Stocks of virgin copper in the United Kingdom are still increasing, the total at September 30 being 123,238 tons, compared with 115,121 tons at the end of August. How much of this is unsold is not known, but when the Government's outstanding purchases are added to its stock, the total must be impressive. At present, the chances of any fall in the price of copper are remote, but if the authorities intend to maintain this large tonnage indefinitely—and their obligations to consumers probably make this course necessary—the risk of making a big loss is quite considerable.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

V. P. Die Casting Company, 15, Robinson Road, London, E.2—£5,000. W. J. Hall.

Bambers Machinery & Metal Merchants (Preston), Frank Street, Preston—£10,000. H. and E. J. Bamber.

Arthur Smith & Son (Limestone), Waen Mine, Gwernaffield, near Mold, Flints—£18,000, A. and J. O. Smith.

F. A. Standen & Sons, 19, Fenchurch Street, London, E.C.3—Agricultural engineers. £50,000. F. A. Standen.

George Gale (Die Casters), 6, New Inns Road, Birchfields, Birmingham, 19—£7,000. J. W. Lloyd and G. W. Bennett.

Moorgreen Metal Industries, Sunnyside, Moorgreen Road, West End, Hants—£10,000. F. T. Toomer and W. G. Sheffield.

N. Kindon & Sons, Oxford Road, W. Hartlepool—Iron, steel, general metal and scrap-metal merchants, welders, engineers, etc. £6,000. N. and J. T. Kindon.

B. J. Cambridge & Company, Britannia Square, Nailsworth, Glos—Metal founders, forgers, etc. £6,000. B. J. J. and H. Cambridge, H. D. Statham, and H. Llewellyn.

A. M. Shippers, Liverpool House, Eldon Street, London, E.C.2—Importers and exporters of metals and machinery, etc. £10,000. E. Klouza, L. Phillips, and W. E. Ridsdale.

Pratt Bros. (Stourbridge), Triumph Works, Enville Street, Stourbridge—To take over the business of engineers carried on as Pratt Bros. at Worcester. £12,000. A. and R. A. Pratt.